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EDITED BY

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With the present volume the Editorship of the Canadian Entomologist passes into new hands. The retiring editor has for some years been conscious of the necessity for this change, owing to the increasing demands on his time of his University duties, which have made it difficult for him to give as much attention to his editorial work as it deserves. It is gratifying, therefore, to know that this work will pass into such capable hands as those of our esteemed colleague, Dr. James McDunnough, of the Dominion Entomological Branch, Ottawa. Dr. McDunnough needs no introduction to the readers of the Canadian Entomologist. His numerous publications on the North American Lepidoptera, among the most important of which are the well-known "Contributions to the Natural History of the Lepidoptera of North America" and the "Check List of the Lepidoptera of Boreal America" have placed him in the front rank of students of this order, and since his appointment to the Dominion Entomological Branch he has extended his activities in several other directions.

In resigning from his office the retiring editor wishes to thank his many friends among our contributors, whose services have been the main source of our journal's continued success, and with whom correspondence has been both a pleasure and a profit.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE-HISTORY OF A HOBBY HORSE.*

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART II. BOY AND MAN—SAPLING GROWTH.

You may easily guess how little London had of attraction for either Slyboots or Merry Andrew; and instead of seeking after the Babylonish gods therein enshrined, we laboured day by day to recreate the childhood world of our delight. In this, with a fair share of luck and the help of some wise and benevolent elders, we were largely successful.

From the very first our young natures shied like roe deer at the city, snuffing the air and stamping uneasily; and this instinctive distrust we soon nursed into a wholesome hate that grew steadily with the years. London, we both agreed, was nothing but a howling wilderness, and for two reasons only could we ever be induced willingly to enter this arid waste; either to rush out at the other side of it on the northern express, or to visit the great oasis at the heart of the desert—the Zoological Gardens.

Yet another district did indeed form the objective of certain long and dreary pilgrimages, on which we were dragged periodically by the Olympians, to the National Exhibitions, those monstrous displays of human industry and

*Part 1 of this paper was published in the 49th Annual Report of the Entomological Society of Ontario, 1918, (1919) pp. 39-46.

inventiveness; but these left only nightmare recollections of footsoreness and headache, so that the name of Kensington brought a bad taste to the mouth, till one memorable day when we discovered, patiently waiting just round the corner for us there, the great Natural History Museum, and at the door, ready to unlock its treasure-house before two pair of the most excited eyes in all London that day, our old Scotch neighbor, donor of the famous Peacock butterfly.

But for the "Zoo," midsummer day itself was all too short, and this in spite of its having had long leagues of lee-way to make up in the affection of one of us. As a boy of eight or nine I had been taken there once before, and the recollection was anything but pleasant. We all have, even in adult life, our off-days, when we are at loggerheads with the whole world and the universe flies to 6's and 7's. At such times the boy of eight appears "possessed" and goes about not merely tempting fate, but actually goading the imps of vengeance into fury. On the wariest urchin that ever played in Tom Tiddler's ground fall sooner or later humiliation and the heavy hand of outraged propriety. On this occasion our superstitious Scotch nurse, with grave shaking of the head, would have pronounced me "fey" and come nearer the mark, I verily believe, than the matter-of-fact Sassenach who declared I had got out at the wrong side of the bed that morning. Whether I had or not I cannot remember, and all I know for certain is that things went wrong from the very start. Long before breakfast I sallied out into our host's garden and tested the blade of a new knife on the stem of a valuable creeper that was being trained up the side of the house; from here I made my way into the barnyard and tried to teach some young ducks to swim under water, so that when "Joe" the farmhand came to their rescue, two of them were at the last gasp with upturned eyes. Finally, being dared by one of my cousins to vault over the widest part of the duck pond, I essayed the impossible; my pole stuck upright in the middle of the pond and I slid ingloriously down into a watery bed of chickweed and had to be rushed into the carpenter's shop to be dried out, surreptitiously, in time for the train journey. When taxed by my uncle, on reports from the indignant custodians of garden and barnyard, and confronted with a long list of acts of wanton mischief—most of them undeniably a true bill—I burst out laughing in his face; it was then, I suppose, that the avenging Furies took me and the situation in hand.

Retribution came with anything but halting gait. Arrived at the Zoo, I must needs choose a Bactrian beast instead of the camel to have a ride on. Camels were too ordinary, we had seen them at the circus and they had only one hump; besides my brother had chosen the camel, so nothing would do but I must be hoisted up between the two hairy humps of this queer looking squealing quadruped for my ride. But alas! the brute was ill-tempered and bolted from its keeper; before it could be rounded up I got pretty badly shaken and worse frightened. My brother witnessed this whole scene of my discomfiture with huge delight from the back of a docile camel, and his ill-concealed grins on my tearful return were more than I could stand. After fiercely denying that I had been a bit afraid, I managed to break away from the rest of the party to do some sight-seeing for myself instead of providing a spectacle for others.

Where all the jungle and prairie life of the tropics were gathered into a single park, one didn't have to go far for thrilling adventures; indeed, one was fairly jostled on all sides by weird-looking foreigners, such as anteaters, tapirs,

peccaries, yaks and gnus, and I had already had several very exciting *tête à tête*s when I spied a heavily built shaggy sort of antelope—like an African wildebeeste in the centre of a large barred cage, staring intently at me with full, soft, gazelle-like eyes; this gentle, melting gaze drew me to the bars in a kind of fascination, and the llama (so I found it was called) came slowly forward as though to be petted; suddenly, at short range, it spluttered out full in my face a deluge of sour-smelling bread mash—having secretly stowed away this ammunition as cud in the top story of its stomach.

Fortunately, there were no witnesses to this second humiliation and I soon regained my composure. But the rest of the day lives mainly in my memory as a long and dreary succession of disagreeables deepening into horror, in which screeching parrots, chattering apes, and the dumb tragedy of live rabbits fed to coiled staring serpents, figure prominently. On the way home, to cap it all, I had the misfortune to sit down in the railway carriage on my very latest toy, a box of gaily coloured tin ducks and fish that would swim about if you wielded over them the magic wand of a little steel magnet; the glass lid caved in, and two of my aquatic treasures, a green carp and a mandarin drake, met in fatal embrace that reduced them both to a shapeless crumple of painted tin.

However, that day of disasters had long vanished from the scene, and nothing untoward marred the re-appearance of the Zoo in our boyhood's drama. And when we, later, discovered the South Kensington Museum, this formed an even stronger attraction, and many a happy hour did we spend in that fairy land of Natural History. Two other places we unearthed in London where it was just possible for self-respecting humanity to eke out an existence not wholly miserable. In a dingy street of Camberwell where "Mourning Cloaks" (*Vanessa antiopa*) had once flown in the fabulous past, we discovered—sole survival of this age of myth—an ancient dealer in butterflies and moths, setting-boards, cork, pins, and nests of little wooden ointment boxes in which to store our captures. Nearer home still, at Herne Hill, under the sooty arch of a railway viaduct stood a fancier's shop with a most extensive assortment of pets, and often after school we would hurry over to make a purchase.

I don't suppose we had any Quixotic notion of inoculating all London with the serum of rusticity, but we certainly made a most heroic effort to cure our own little suburban corner of all its ailments by a healthy transfusion of country blood; we fairly filled the back yard with white rats, mice, rabbits, Belgian hares, guinea pigs, and pigeons; while in every spare room and corner of the house itself we staked claims for swarms of tiny squatters; caterpillars striped and spotted, smooth, horned and hairy, butterflies and moths, dragonflies, beetles and spiders, were constantly escaping from their glass-lidded confines to disturb the calm of Olympus. We had even in one of the bedrooms an active industry of bird-stuffing and pelt-curing that has long mouldered away in my memory to a confused tangle of wire, cotton-wool, cayenne pepper and scalpels.

The district of West Dulwich in the early eighties still retained no small tang of the country about its atmosphere. There were traces here and there, within a stone's throw of our house in unoccupied fields, muddy pools, and decrepid old willows, of what had once been a sparkling meadow-brook flowing past the old-fashioned residence of Rosendale Hall, which tradition averred

had been the favorite hunting lodge of Queen Elizabeth; and, indeed, astride the back of that letter "n" in the middle of the word "Rosendale," the curious linguist may wing his way back not merely to the days of Good Queen Bess, when doubtless the place was still a valley of roses, but to a time in Old England long before Chaucer when the plural of "rose" was "rosen."

East of us the wooded estates of Edward Alleyn, Shakespeare's friend and fellow actor, were not yet all built over. There were still shady slopes on Gypsy Hill, and though the gypsies with their picturesque tents had vanished forever before a standing army of red and yellow brick houses, the nightingale still sought its ancestral home there among the trees each spring and made music in the land. Beautiful woods still flourished near the Crystal Palace at Sydenham, and an oak grove within the school playground itself, where the voice of the earliest cuckoo might be heard and even its elusive form spied in stealthy flight from tree to tree.

In that same ground, quite close to the Chatham and Dover railway I got my first sight of gaily spotted newts in a neglected clay pond, and once caught in the long grass a beautiful green lizard. It was from here too that I gathered, feeding in a clump of small-headed purple thistles, part of a colony of Black-spined caterpillars to rear at home. The list of British butterflies is a very meagre one compared with that of a great continent like North America, and even of that meagre list quite a number of species were unknown in our part of Scotland. There was frantic joy in the house when these dark thorny caterpillars, after a short pupation emerged into the most beautiful "Painted Ladies" (*Vanessa cardui*). One of the most amazing things to watch was the way they shot out a secretion of pink milk at emergence, squirting it over their wings to saturate them before the work of unfolding and stretching could be safely embarked on.

The whole neighborhood was largely residential; the houses all had gardens enclosed by fences of narrow oak lattice overlapping vertically and topped with a narrow coping of the same; shade-trees—mostly elm, poplar, willow and linden—abounded about the roads; many of the gardens boasted trees and shrubbery, and these wooden fences made a surprisingly good cover for insects at all stages; but, especially, I recall the number and variety of chrysalids to be found in the angle of the coping. We used to tramp the sidewalks for miles, running our eye along this groove by the hour, once in a while glancing down the vertical lines just to take the crick out of our neck and corral any stray game that we might have overlooked on the surface of the fence.

Among other captures made in this way, I recall the Goat Moth, the Leopard Moth, the Lappet and Oak-egger. The Goat Moth (*Cossus ligniperda*) was a large dark-grey creature, whose larva bores in willow and poplar, has a lurid brown-crimson hue, an evil odor, and the enviable reputation of having been eaten by the Romans; we often saw the dark-brown gutterings, like trickles of tobacco juice, at the mouth of their burrows in the poplar trunks. There is in Ontario a closely related genus of the Cossid family in the common *Prionoxystus robiniae*, which I found abundant one summer on Trout Island in the Rideau and occasionally about Port Hope, infesting poplars more often than the locust tree; the *Cossus* itself occurs in two species of North America, *Cossus centerensis*, a small moth of the Atlantic States, and *Cossus undosus* of the Rockies. The

Leopard Moth (*Zeuzera pyrina*) also belongs to the *Cossidae* and has recently become established on Long Island, as a borer in maple and elm. The Oak-Egger and the Lappet are both of the genus *Gastropacha* and closely akin to the moths of our Apple and Forest Tent caterpillars, all of them being members of the family *Lasiocampidae*.

On our next door neighbor's hedge of lime trees we early took two prizes that filled us with delight, though both subsequently proved to be common; one was the handsome Lime Hawk Moth or Sphinx (*Smerinthus tiliae*) and the other the beautiful Buff Tip Moth (*Phalera bucephala*), whose gregarious larvæ used to crawl down in marshalled hosts to the fences and side walks; this belongs to the family *Notodontidae*, and is next of kin to the famous Puss and Lobster Moths, the extraordinary caterpillars of which were both destined to cross our path at rare intervals, throwing the lucky finder into transports of joy.

Over one of our own garden fences grew a dense mass of ivy, and here, at rest or on the wing we caught many new kinds of day- and dusk- or night-flying moths; the Yellow Underwing, Swallow-tail, Brimstone, Ermine, Currant, and Vapourer are some that I recall; the female of the last was wingless like a penguin, and the caterpillar a very pretty creature, though its tufts of yellow, and the red-and-black floating hairs that we admired proclaim it to have been of the ill-omened tussock brood.

A favourite pastime was net-wielding in the garden at night, and one of the most vivid of these 37-year-old memories is our first encounter with the Ghost Moth (*Hepialus lupulinus*): the male of this creature has a glistening white lustre on the upper surface of its wings and a neutral-tinted yellow-brown on the under; its flight is swift and irregular like a snipe's; in its zig-zag course it presents, now the upper, now the under surfaces of its air-planes in baffling alternation, one moment a dazzling beacon and the next blotted out in some inky pool of darkness; had its position in space been constant like that of a fixed star, or its orbit regular as a planet's we might have tracked it down with the certainty of the rotary lamp on Eddystone Lighthouse, but as it was it would twinkle here and flash again there with all the eccentricity of a runaway comet. Our final capture of this elusive will-o'-the-wisp was a supreme triumph like the landing of a first sea-trout. The Rev. J. G. Wood explains in his "Common British Moths," that it is on settling only that the insect disappears, but—*experto crede*—we knew better; while in full flight across an open lawn, at six or eight feet from the ground, it would often disappear and reappear in a single second of time.

(To be continued.)

APPOINTMENT TO ENTOMOLOGICAL BRANCH, OTTAWA.

Dr. F. C. Craighead, late of the Bureau of Entomology, Washington, D.C., arrived at Ottawa at the beginning of the New Year to take up his duties as Entomologist in the Division of Forest Insects. The Branch is very fortunate in securing the services of Dr. Craighead, on account of his wide experience and training.

DRAGONFLIES OF THE LAKE OF BAYS REGION.

BY J. MCDUNNOUGH, PH. D.*

Entomological Branch, Dept. of Agriculture, Ottawa.

The period from June 28th, to July 15th, of the summer of 1920 was spent by myself at Norway Point on the Lake of Bays. Considerable collections of insects were made, rather particular attention being paid to the Odonata and allied orders. A list of the species of Odonata taken would appear to be of interest not only as a supplement to Dr. E. M. Walker's reports on the Odonata of Algonquin Park and the Go Home Bay region, but also on account of the fact that several species new to our Canadian lists were observed and the known northern range-limit in such instances considerably extended.

The Lake of Bays region is in general topography very similar to that of Algonquin Park or the Muskoka Lakes. Along the shores of the Lake of Bays proper few dragonflies were observed, but the smaller lakes and ponds proved to be quite rich in species. The main collections were made (1) around Black Lake, a small tranquil lake, just south of the Norway Point golf links, with heavily wooded, precipitate shores, except at a few points at the northern end where the ground was flatter and a considerable growth of sedges and water lilies was to be found; (2) at a small marshy pond on the Baysville road, which I have designated Brown's Brae Pond, and which I unfortunately only discovered during the latter half of my sojourn.

Twenty-six species in all were captured; the following list is probably far from exhaustive, but will at least serve as a basis for further investigations.

ZYGOPTERA.

Coenagrionidæ.1. *Lestes eurinus* Say.

Four males of this unmistakable species were taken on July 11th among the sedges at Brown's Brae Pond. As far as can be ascertained from the available literature, this constitutes a new record for our Canadian fauna.

2. *Lestes rectangularis* Say.

One teneral male was taken on June 24th on a wooded slope rather remote from any body of water.

3. *Lestes disjunctus* Selys.

A series of more or less teneral males and females was captured on July 11th and 14th around Brown's Brae Pond.

4. *Agria moesta putrida* Hagen.

Only a single female was taken at Black Lake on July 1st. Two males were captured on July 28th, 1919, on a road skirting the Lake of Bays east of Norway Point.

5. *Enallagma hageni* Walsh.

Common around Black Lake and Brae Pond, June 23rd to July 8th. A number of the males showed the fifth abdominal segment suffused with black for at least half its length, a feature not noticed in our Ottawa specimens of this species; no difference in genitalia, however,

*Contribution from Ent. Br. Dept. of Agr., Ottawa.

could be detected between these darker forms and the normal one, which also occurred in the same localities.

6. *Enallagma cyathigerum* Charp. (*annexum* Hag.)

One male, June 23rd, Black Lake; taken along with the following species. The genitalia correspond exactly with Williamson's figure of *annexum* in Ent. News, XI, pl IX. Walker records a single male from Go Home Bay (1915, Suppl. 47th Ann. Report, Mar. and Fisheries Branch, 66) so that the occurrence of the species in the present region is not unusual.

7. *Enallagma calverti* Morse.

Both sexes very common in copula around the Brae Pond, July 11th to 14th; a few specimens were also captured at Black Lake in June.

8. *Enallagma aspersum* Hag.

Ten males and one female of this dark-bodied species were taken around the Brae Pond on July 11th. The species does not appear to have been previously recorded from Canada, but the similarity of genitalia of the male specimens to Needham's figure (Bull. 68, New York Sta. Mus., pl. XIX) renders the reference fairly certain.

9. *Nehalennia irene* Hag.

Common during the first half of July in the sedges bordering Brown's Brae Pond, but easily overlooked on account of the low flight and small size.

10. *Chromagrion conditum* Hag.

A single male was taken, June 23rd, at Black Lake. No further specimens were seen, although diligent search was made on subsequent dates.

11. *Ischnura verticalis* Say.

Extremely common all through the season at both places.

ANISOPTERA.

Aeshnidæ.

12. *Gomphus exilis* Selys.

Common along the shores of Black Lake, June 20th to July 1st.

13. *Gomphus spicatus* Hag.

One female taken along with *G. exilis*, June 28th, belongs apparently to this species rather than to *sordidus*, judging by the remarks of Kellicott (Odonata of Ohio) and Williamson (Dragonflies of Indiana) and their descriptions of vulvar laminae.

14. *Basiaeschna janata* Say.

One male, July 1st, and one female, June 20th; others were observed flying over the waters of a shallow inlet of the Lake of Bays.

15. *Aeshna canadensis* Wlk.

Common during July around Brown's Brae Pond and vicinity but difficult to capture. Three males were taken.

Libellulidæ.

16. *Didymops transversa* Say.

Three males and two females were taken June 23rd, July 1st, patrolling along a moist road through a rather dense wood, busily

engaged in capturing mosquitoes. The species was not seen in any other situation.

17. *Tetragoneuria cynosura simulans* Muttk.

One of the commonest species of the district and on the wing during the whole period of my stay. It frequents the borders of woods and open meadows, seldom alighting but tirelessly patrolling to and fro in search of food.

18. *Cordulia shurtleffi* Scud.

Not rare, early in July, on the edges of woods in semi-shady places; it is not a strong flier and is easily recognized on the wing by the brilliant green colour of the eyes. Only males were captured.

19. *Libellula exusta julia* Uhl.

Very common in June and early July on the margin of lakes and ponds, frequently resting on dead logs.

20. *Libellula incesta* Hag.

Three males and two females captured, July 1st and 10th; the species was not uncommon along the shores of Black Lake, the males darting from their resting places for short excursions and returning to sit in their characteristic attitudes on either tree-trunk or twig. Walker (op. cit. p. 92) records the species from Go Home Bay; evidently it has a more widespread northern range than has heretofore been supposed.

21. *Libellula quadrimaculata* Linn.

Quite rare in this region; only two males were captured on the border of woods near Black Lake.

22. *Leucorrhinia frigida* Hag.

Five males were taken, July 11th, among the sedges bordering Brown's Brae Pond.

23. *Leucorrhinia proxima* Cal.

Four males were taken along with *L. frigida*. The species is fond of resting on half-submerged logs and is then not difficult to capture. The pruinose suffusion on the dorsum of the males extends in this species over the fifth abdominal segment whilst in all specimens of *frigida* examined this segment remains black.

24. *Leucorrhinia glacialis* Hag.

One male, taken with the other species of the genus. On the wing it at once strikes the eye by the brilliant red coloration of the base of the abdomen.

25. *Leucorrhinia intacta* Hag.

One female was taken on the roadside, June 20th, near the Brae Pond. Apparently the flight of the species was at this time already almost over.

26. *Sympetrum obtrusum* Hag.

The species was just beginning to emerge, July 11th to 14th, at the Brae Pond. A single pair only was captured but later in the month the species would doubtless become commoner, along with others of the genus.

SYNOPSIS OF THE ANTHOMYIID GENERA MYDÆA, OPHYRA, PHYLOGASTER, TETRAMERINX, AND EULIMONOPHORA (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

The genus *Mydæa* as here limited is essentially northern in its distribution, most of the species being found in the extreme northeast and northwest, with a few occurring as far south as Texas, though rarely. Stein lists about 300 species in this genus, but very few indeed of the species so listed really belong to the genus as I have discovered by examining a great number of the species involved. Most of the species he lists as belonging to this genus from North America belong to *Helina*. The other genera dealt with in this paper have but few representatives in this country, and two of them, *Tetramerinx* and *Phyllogaster*, are unknown from the old world.

Mydæa Robineau-Desvoidy

This genus is distinguished from its allies by having the third wing-vein setulose at base, fourth not curved forward at apex, hind tibia without calcar, penultimate abdominal sternite in female with a number of short bristles, eyes of male subcontiguous, prealar bristle present, prosternum bare, face not buccate.

KEY TO SPECIES.

MALES.

1. Legs largely or entirely black; knobs of halteres black or brown except in *calvicrura*.....2.
Legs with the exception of the tarsi, and sometimes part of the fore femora, yellowish testaceous; knobs of halteres pale.....4.
2. Eyes with dense hairs; halteres pale yellow.....*calvicrura* Coquillett.
Eyes bare; halteres black or brown.....3.
3. Arista with the longest hairs as long as width of third antennal segment; wings slightly infuscated throughout.....*obscura* Stein.
Arista with the longest hairs not longer than its basal diameter; wings slightly brownish, the bases of veins orange yellow.....*rugia* Walker.
4. Scutellum largely or entirely yellow, contrasting sharply with the colour of disc of thorax.....5.
Scutellum coloured as disc of thorax.....7.
5. Palpi yellow, antennæ almost entirely so.....*flavicornis* Coquillett.
Palpi black, antennæ almost entirely so.....6
6. Hind femur without bristles on posteroventral surface except at extreme apex.....*occidentalis* Malloch.
Hind femur with a series of long, fine, rather closely placed bristles on apical half of posteroventral surface.....*pagana* Fabricius.
7. Antennæ entirely black; longest hairs on arista at least as long as width of third antennal segment; fore femora infuscated except in *discimana*.....8.
Second antennal segment brownish yellow; longest hairs on arista not as long as width of third antennal segment; claws of fore tarsus not as long as apical tarsal segment; fore femora yellow.....*persimilis* Malloch.

8. All femora largely fuscous; hind tibia with one strong and sometimes one weak anteroventral bristle; prealar bristle minute; wings not yellow at bases.....*obscura* Stein.
At most the fore and mid femora infuscated; wings yellow at bases, or dorsum of thorax indistinctly vittate.....9.
9. Small species, 5.5 to 6.5 mm. in length; thorax and abdomen with distinct but not very dense pruinescence, the former distinctly vittate only in front; prealar bristle very small.....*winnemanna* Malloch.
Larger species, 7 to 9 mm. in length; thorax and abdomen with dense yellowish pruinescence, the former with very distinct vittæ.....10.
10. Fore femora yellow; second antennal segment brown; prealar bristle one-third as long as the one behind it.....*discimana* Malloch.
Fore femora infuscated; second antennal segment black; prealar bristle over half as long as the one behind it.....*urbana* Meigen.

FEMALES.

1. All femora largely or entirely black.....2.
Femora reddish yellow, sometimes the fore pair brownish or fuscous in part6.
2. Eyes distinctly hairy.....*calvicrura* Coquillett.
Eyes bare.....3.
3. Arista with its longest hairs not longer than its basal diameter.....*rugia* Walker.
Arista with its longest hairs as long as or longer than width of third antennal segment4.
4. Third antennal segment distinctly less than 4 times as long as its greatest width; mid and hind femora entirely or almost entirely black or fuscous5.
Third antennal segment at least 4 times as long as its greatest width; mid and hind femora, and especially the latter very indistinctly infuscated.....*winnemanna* Malloch.
5. Calyptræ white; tibiæ yellowish testaceous.....*obscura* Stein.
Calyptræ orange yellow; legs entirely black.....*obscura* Malloch.
6. Scutellum largely or entirely yellow, contrasting sharply with the disc of mesonotum.....7.
Scutellum black, concolorous with disc of mesonotum.....9.
7. Palpi and antennæ yellow.....*flavicornis* Coquillett.
Palpi entirely, antennæ largely black.....8.
8. Humeral angles of thorax broadly yellow.....*occidentalis* Malloch.
Humeral angles of thorax coloured as disc.....*pagana* Fabricius.
9. Apical segment of fore tarsus disclike, as broad as long; fore tibia with a median posterior bristle*discimana* Malloch.
Apical segment of fore tarsus normal, about twice as long as wide.....10.
10. Arista densely short-haired, the longest hairs barely as long as its basal diameter; fore tibia with 1 posterior and 1 postero-ventral bristle.....*armatipes* n. n. (*armipes* Malloch nec. Stein).
Arista with long hairs, the longest of which are at least as long as width of third antennal segment, or the fore tibia with or without one bristle11.

11. Arista with its longest hairs barely longer than its basal diameter.....*persimilis* Malloch.
 Arista with its longest hairs, longer than width of third antennal segment.....*urbana* Meigen.

Ophyra Robineau-Desvoidy

There are but two species of this genus known to me as occurring in America one of which, *leucostoma*, occurs in Europe and in Canada and all over the United States, though less common in the south. The other species is confined to the southern United States in North America, but extends through Central and South America. The larvæ feed in latrines and in manure.

KEY TO SPECIES.

1. Males.....2.
 Females.....3.
 2. Hind tibiæ much curved, ventral surfaces with long, soft hairs which are longest just basad of middle; calyptræ fuscous; palpi black.....*leucostoma* Wiedemann.
 Hind tibiæ but little curved, ventral surfaces with decumbent setulose hairs; calyptræ yellow; palpi ferruginous.....*aenescens* Wiedemann.
 3. Calyptræ subfuscous, the margins darker; palpi black; hind tibia with 3 to 6 anteroventral bristles.....*leucostoma* Wiedemann.
 Calyptræ yellow; the margins concolorous; palpi ferruginous; hind tibia with 1 or 2 anteroventral bristles.....*aenescens* Wiedemann.

Tetramerinx Berg.

KEY TO SPECIES.

1. Legs black, bases of tibiæ and extreme apices of femora reddish; abdomen with a dark dorsocentral vitta; face, parafacials, and cheeks white, almost silvery; wings milky, veins brown; hind tibia with three or four anterodorsal bristles.....*unica* Stein.
 Legs black, all of tibiæ and extreme apices of femora reddish yellow; abdomen with black dorsocentral vitta and lateral spots; face, parafacials, and cheeks brownish or bronzy; wings slightly grayish, veins dark brown; hind tibia with two anterodorsal bristles.....*californiensis* Malloch.

Phyllogaster Stein

KEY TO SPECIES.

1. Males.....2.
 Females.....4.
 2. Mid femur with some long, strong bristles on basal half of antero- and posteroventral surfaces; hind femur with rather widely placed bristles on entire length of anteroventral surface; abdomen with dorsocentral vitta and lateral spots; mid tibia with an anterodorsal bristle.....*robusta* Johnson.
 Mid femur without anteroventral bristles on basal half; hind femur with a few strong bristles on apical half of anteroventral surface; mid tibia without an anterodorsal bristle.....3.

3. Abdomen with dorsocentral vitta and more or less distinct lateral black spots; hind tibia with 1 anteroventral bristle; the pair of long bristles on basal portion of hypopygium widely separated, much closer to latero-posterior margin than to central cleft; processes of fifth sternite as broad as long.....*cordyluroides* Stein.
 Abdomen with only a more or less distinct dorsocentral vitta, the lateral spots absent; hind tibia with two anteroventral bristles; the pair of long bristles on basal portion of hypopygium rather closely placed, much closer to central cleft than to lateroposterior margin; processes of fifth sternite longer than broad.....*littoralis* Malloch.
4. Hind femur with rather widely spaced bristles on entire length of anteroventral surface; apical genital segment with two strong thorns; scutellum with numerous setulose hairs on entire upper surface.....*robusta* Johnson.
 Hind femur with strong bristles only on apical half of anteroventral surface.....5.
5. Apical genital segment with two strong thorns; hind tibia with one anteroventral bristle; scutellum with a number of setulose hairs on disc.....*cordyluroides* Stein.
 Apical genital segment with four strong thorns; hind tibia with two anteroventral bristles; scutellum very rarely with more than two discal setulae.....*littoralis* Malloch.

Eulimnophora Malloch

This genus is represented by many species in Africa.

KEY TO SPECIES.

1. Thorax conspicuously vittate; palpi and tibiae largely yellowish.....*dorsovittata* Malloch.
 Thorax inconspicuously vittate; palpi black; tibiae black, sometimes yellowish at bases.....2.
2. Large species, normally over 4 mm. in length; hind femora in both sexes with from 3 to 6 bristles on apical half of anteroventral surface, the space basad of these with weak decumbent hairs.....*arcuata* Stein.
 Smaller species, less than 4 mm. in length; hind femora in both sexes with a series of short erect bristles, which are rather closely placed, from base to apex on anteroventral surface, the apical two or three much longer than the others.....*cilifera* Malloch.

Xenocœnosia Malloch

KEY TO SPECIES.

1. Males.....2.
 Females.....4.
2. Large species, 4.5 mm. in length; abdomen without glossy bare areas on sides of third and fourth tergites; hind femur without dense, soft hairs on ventral surfaces, the antero- and posteroventral surfaces with long, black bristles which are unequal in lengths, the longest one on anteroventral surface about one-third of the femoral length from apex.....*major* Malloch.

- Smaller species, 3.5 mm. in length; abdomen with a large, glossy, bare area on each side of third and fourth tergites; hind femur with dense, soft hairs on ventral surfaces, and with or without a fine bristle near apex on anteroventral surface, no other bristles on this surface.....3.
3. Antennæ entirely pale yellowish testaceous; apical scutellar bristle almost or quite as long as the lateral pair; one bristle near apex of anteroventral surface of hind femur very distinctly stronger than the rather short ventral pale hairs.....*calopyga* Loew.
- Antennæ with the exception of apex of second segment and base of third black; apical scutellar bristles much weaker than the lateral pair and shorter; apical bristly hair on anteroventral surface of hind femur hardly distinguishable from the very long, pale ventral hairs.....*floridensis* Malloch.
4. Hind femur without a bristle near apex on anteroventral surface, the one nearest apex about one-third from it.....*major* Malloch.
- Hind femur with a bristle very near apex on anteroventral surface.....5.
5. Second antennal segment and basal half of third yellowish; apical pair of scutellar bristles little shorter than laterals.....*calopyga* Loew.
- Antennæ except extreme base of third segment black; apical pair of scutellar bristles very much shorter than lateral pair.....*floridensis* Malloch.

ANNOTATED CHECK LIST OF THE MACROLEPIDOPTERA OF ALBERTA—ADDITIONS, 1919.

BY KENNETH BOWMAN,
Edmonton, Alta.

The following additions to my "Check List of the Macrolepidoptera of Alberta," published by the Alberta Natural History Society (Edmonton, 1919) were made during the season of 1919.

The abbreviations are the same as those employed in the Check List. The numbers before the names are those of Messrs. Barnes and McDunnough's "Check List of the Lepidoptera of Boreal America, 1917." The numbers after the names indicate the months in which the insects have been taken. The capital letters are abbreviations of the localities of capture, as follows: E, Edmonton; R, Red Deer; G, Gleichen; P, Pocahontas; N, Nordegg; B, Banff; Bm, Blairmore.

33	<i>Pieris occidentalis calyce</i> Edw.....	4 E.P.
57	<i>Eurymus hecla glacialis</i> McLach.....	6 N.†
59	" <i>eriphyle autumnalis</i> Ckll.....	5-6 E.B.N.R.
64	" <i>christina pallida</i> Ckll.....	7 N.R.
	" <i>christina gigantea</i> Stkr.....	7 E.N.R.
157	<i>Argynnis leto</i> Behr.....	7 Bm.
185	" <i>bischoffi</i> Edw.....	7-8 P.N.
211	<i>Euphydryas nubigena beani</i> Skin.....	7 P.
283	<i>Vanessa virginiensis</i> Dru.....	7 E.
407	<i>Heodes helioides florus</i> Edw.....	7-8 E.N.R.
794	<i>Pseudohazis eglanterina</i> Bdv.....	6 Bm.
1076	<i>Melaporphyria immortua</i> Grt.....	5 E.

1275	<i>Euxoa infracta</i> Morr.....	8 Bm.
1315	“ <i>quinquelinea lutulenta</i> Sm.....	9 Bm.
1339	“ <i>campestris</i> Grt.....	8 E.
1986	<i>Rancora brucei</i> Sm.....	6 N.
2137	<i>Graptolitha ferrealis</i> Grt.....	4 E.
2380	<i>Luperina passer conspicua</i> Morr.....	7 E.
2513	<i>Merolonche ursina</i> Sm.....	6 N.
N.S.	<i>Autographa diversigna</i> Ottol.....	7 N.+
N.S.	“ <i>interalia</i> Ottol.....	8 E.N.
3333	<i>Syneda allenii saxeae</i> Hy. Edw.....	6 Bm.
3712	<i>Olene willingi</i> B. & McD.....	7 E.
3972	<i>Coryphista meadi</i> Pack.....	6 7 Bm.
3999	<i>Dysstroma cervinifascia</i> Wlk.....	7 N.
4017	<i>Hydriomena renunciata</i> Wlk.....	5-6 E.
4208	<i>Eupithecia albicapitata</i> Pack.....	7 E.
4332	<i>Philobia ulsterata</i> Pears.....	6 E.
4349	<i>Macaria purcellata</i> Tayl.....	7 N.
4465	<i>Caripeta divisata</i> Wlk.....	7 E.
4489	<i>Pygmaena simplex</i> Dyar.....	7 N.
N.S.	<i>Loxostege albertalis</i> B. & McD.....	7 G.
5032	“ <i>commixtalis</i> Wlk.....	6-7 B.N.
5051	<i>Diasemia plumbosignalis</i> Fern.....	7 N.
5088	<i>Phlyctænia ferrugalis</i> Hbn.....	6 E.
5135	<i>Pyrausta fumoferalis</i> Hlst.....	6 E.

ADDITIONAL RECORDS OF DRAGONFLIES FROM THE OTTAWA REGION.

BY J. MCDUNNOUGH, PH. D.*

Entomological Branch, Dept. of Agriculture, Ottawa.

The following species of Odonata, not recorded in Dr. E. M. Walker's paper (1908, Ottawa Nat. XXII, 16) have been taken by me this past summer in this region.

Zygoptera.

Enallagma calverti Morse.

Common, June 3rd, at Mackay Lake, Rockcliffe.

Enallagma carunculatum Morse.

Not uncommon, July 28th on the shore of Leamy Lake, Hull, Que.

Coenagrion resolutum Selys.

Taken along with *E. calverti* on June 3rd.

Anisoptera.

Gomphus descriptus Banks.

One male was captured along Meach Brook, June 13th, about 1½ miles from the railway station of Cascades, Que.

Gomphus spicatus Hag.

Two males, June 3rd, Mackay Lake, Rockcliffe.

*Contribution from Ent. Br. Dept. of Agr., Ottawa.

FOUR NEW SPECIES OF MELYRIDÆ (COLEOPTERA).

BY FRANK E. BLAISDELL, SR.,
Stanford University.

It has been recognized for a long time that the species of *Eschatocrepis*, inhabiting principally southern California, possesses pale legs while those from the coastal regions of central California have blackish legs, and as a whole are more deeply pigmented. Casey has mentioned differences observed by him in specimens from San Diego and Santa Barbara. The following species is described at the present time:

***Eschatocrepis nigripes*, new species.**

Form elongate. Colour deep black, more or less shining; antennæ dark rufo-piceous; tibiæ and tarsi rufo- to nigro-piceous. Surface microscopically reticulate. Pubescence short, sparse and more or less grayish. Head not quite as wide as the pronotal apex; front slightly convex, impressions feeble. Second joint of the antennæ subglobose, about as long as wide; fifth joint scarcely triangular, although a little more anteriorly prominent than the contiguous joints. Pronotum slightly wider than long; sides parallel, not strongly arcuate in basal half, broadly sinuate in the apical half behind the apical angles which are moderately small and rather prominent laterally; basal angles obtuse, not rounded nor prominent; base feebly rounded; apex broadly arcuate-truncate and prominent anteriorly in middle four-sixths, laterally oblique and somewhat posteriorly declivous to the angles; disk more or less impressed in the median line, submarginal line strong, surface impressed on the lateral declivity at the sinuations, punctures small and sparse, densely granulato-punctate laterally. Elytra scarcely wider at base than the widest part of the pronotum, about two and two-thirds times longer than the width at base; sides more or less slightly divergent posteriorly, punctuation rather fine, scarcely sparse, surface very feebly rugoso-reticulate; apex slightly serrulate, apical margin somewhat explanate. Abdomen subglabrous, very finely sculptured, punctures denser and finer at apex of the fifth segment.

Male.—More elongate and narrower. Sides of the elytra scarcely divergent posteriorly, apex broadly and very gradually rounded to apex. Fifth ventral abdominal segment transversely truncato-sinuate in middle two-fourths of the apex, lateral fourths oblique and set with a row of stiff marginal hairs; angles rather prominent on their ventral surface and bearing a tuft of slightly longer hairs, intervening apical surface slightly declivous.

Female.—Relatively shorter behind and more dilated. Fifth ventral with a feeble but distinct, rounded emargination, angles raised and distinctly prominent on their ventral surface, forming the sides of the feebly impressed and declivous intervening surface.

Length 2.3–3.2 mm.; width .7–1.3 mm.

Type locality.—Sausalito, Marin County, California.

Holotype, male, and allotype, female, in my own collection. Paratypes in the collection of the California Academy of Sciences.

Habitat.—California (Sausalito and Fairfax, Marin County, April 26th, Leona Heights, Alameda County, May 5th.

It seems necessary to give the above phase a distinctive name, on account of colour, genital characters and other minor differences. It frequents the blossoms of the wild morning glory (*Convolvulus*); it is rather abundant. In *Eschatocrepis constrictus* Lec. the legs are pale and, as a whole, the insect is much less pigmented than *nigripes*.

Casey in his Coleopterological Notices, VI, p. 460, Annals N. Y. Acad. Sci., VIII, July, 1895, created the genus *Eudasytes* for three species which he deemed advisable to separate from *Trichochrous*, the essential difference being the rather wide, flat and horizontal epipleura, and the lateral margins of the elytra narrowly reflexed. The apical angles of the pronotum are usually stronger and more prominent anteriorly than in any species of *Trichochrous*, except a few species like *suturalis*, for instance. I see no reason why *Eudasytes* should not be recognized as a valid genus. At the present time I will describe three new species as follows:

***Eudasytes reynoldsi*, new species.**

Form broad, oblong, about twice as long as wide. Colour black; antennæ piceous, more or less rufo-piceous in basal half; legs rufous to rufo-testaceous; surface rather shining. Pubescence not long, abundant but not hiding the body surface, grayish to subluteo-cinereous in colour and recumbent; pronotal margin fimbriate, fimbriæ erect and of moderate length, not conspicuous; those of the elytral margin similar and obliquely directed; head, pronotum and elytra with stiff, semi-recumbent, sparsely placed and not long nor conspicuous blackish setæ. Head rather small, about two-thirds as wide as the pronotal apex, sparsely to almost densely punctate, punctures moderate in size; surface broadly impressed just between the antennæ, impression more definitely but briefly longitudinally marked laterally. Antennæ stout, joints five to eleven subequal in width, subserrate anteriorly. Pronotum widest at base which is about a third wider than the apex; length a little less than the width of apex; sides almost straight and convergent toward apex, margin subexplanate with the adjacent discal surface almost grooved; apex broadly and deeply emarginate between the anteriorly prominent, rather wide, broadly and evenly rounded apical angles. At the angles the margin is somewhat reflexed and the discal surface distinctly grooved within; base rather broadly arcuate at middle, oblique laterally to become sinuate within the large, prominent and more or less everted angles which are subobtuse at tip; margins of the angles rather reflexed; surface quite deeply impressed within; disk quite strongly convex centrally and anteriorly, slightly impressed within the angles and along the margins, punctures moderate, separated by a distance equal to three or five times their diameter, denser laterally, surface almost separate within the angles. Elytra about a half longer than wide, moderately convex, but somewhat flattened on the disk; humeri prominent, dentiform, everted and obtuse, umbone prominent and rounded; margin somewhat explanate, finely serrulate, arcuately reflexed with the surface rather broadly channelled within, especially at the humeri, broadly rounded at apex, sutural angles rounded; punctuation rather sparse, much coarser toward the base than at apex. Abdomen densely punctate.

Male—More broadly oblong; pronotum broader and larger, basal angles more strongly developed. Humeri broadly dentiform.

Female.—Head and pronotum smaller, basal angles of the latter and humeri less strongly developed.

Length 4.0 mm.; width 1.75–2.0 mm.

Type locality.—Truxton Valley, Mohave County, Arizona, June, altitude 4,205 feet; J. A. Kusché collector.

Holotype, male, in my own collection. Allotype, female, and a male paratype, in the collection of L. R. Reynolds, to whom I dedicate the species.

***Eudasytes grandicollis*, new species.**

Form large, stout and oblong, about twice as long as wide. Colour black, pronotum shining; legs rufo-ferruginous; antennæ piceous, rufous toward the base. Pubescence dense on the elytra, sparse and not hiding the surface on the head and pronotum; cinereous, slightly fulvous with a subsericeous lustre, recumbent and moderately long, sparsely intermixed with erect pale setæ, which are more abundant and blackish on the head and pronotum; marginal pronotal fimbriæ pale, moderately long and rather close-set, those of the elytra longer, less fimbriiform and not as close. Hairs rather dense on the body beneath. Head moderately large; front not convex, broadly bi-impressed; punctures sparse and rather small, although somewhat coarse on the vertex. Antennæ stout and not extending to the middle of the pronotum, subserrate anteriorly from the fourth joint, where the angles are rounded and somewhat tumid. Pronotum large in both sexes, transversely oblong, less than a fourth wider than long; sides parallel, broadly and evenly arcuate, sometimes slightly sinuate or straight just before the basal angles, the latter obtuse and distinct; lateral marginal bead distinctly reflexed; apex broadly and arcuately emarginate, a little narrower than the base and with a distinct reflexed bead; apical angles prominent anteriorly, large, rather broad and narrowly rounded; base broadly and strongly arcuate in middle three-fifths, thence subsinuate to the angles; disk strongly arcuate at the periphery, less so in the broad central area, punctures small and very sparse, surfaces smooth and shining; a distinct submarginal, gutter surrounds the entire disk, rather wide at apex (male) and distinctly widened at the angles, surface somewhat impressed at basal sinuations. Elytra about a third longer than wide; sides parallel, apex rounded laterally but subtruncate at the suture, angle narrowly rounded, marginal bead rather broad and reflexed, especially behind the humeri, the latter with a distinct umbone; disk moderately convex from side to side, punctures small, rather closely placed, surface somewhat rugose. Marginal gutter rather broad, especially near the humeri. Epipleura broad, horizontal almost to the extreme apex, impunctate and without pubescence, except toward the base. Margins convergent on the apical curve. Abdomen finely and rather densely punctate. Legs relatively slender.

Male.—Rather stouter. Pronotum large and heavy. Fifth ventral transversely truncate at apex.

Female.—Head rather smaller. Pronotum smaller. Fifth ventral broadly but strongly rounded at apex.

Length 4.0–4.6 mm.; width 1.7–2.2 mm.

Type locality.—Tonopah, Nevada.

Holotype, male, and allotype, female, in my own collection. Paratypes in the collection of the California Academy of Sciences.

Forty-eight specimens studied. A moderate series was collected at Tonopah Nevada, by my mother-in-law, Mrs. E. C. Peek; a similar series was taken at Goldfield, Nevada, by Mr. F. W. Nunenmacher. The species was collected June 29th, 1907, from the blossoms of an undetermined plant.

A large species related to *amplus* Casey and *oblongus* Casey by the horizontal epipleura, which extends to the extreme apex of the elytra. *Grandicollis* appears sufficiently distinct and inhabits a different region from Casey's species.

***Eudasytes hirsutus*, new species.**

Form oblong, about two and a third times longer than wide, moderately convex. Colour deep black and shining; femora nigro-piceous, tibiae rufo-piceous, tarsi almost rufous; antennae rufous or rufo-piceous toward base and piceous distally; mouth-parts more or less rufous. Pubescence brownish-gray and sparse; subrecumbent hairs about a third as long as the long flying hairs which are bristling throughout, sparse and equally distributed over the elytra and pronotum; marginal fimbriae of the pronotum and elytra long, blackish and not close set. Head moderately large, front scarcely convex, feebly bi-impressed, with a small, smooth feebly convex area near the apical margin; punctures small, irregular and sparse. Antennae rather stout, subserrate anteriorly, angles blunt and rounded, last three joints noticeably thick. Eyes finely setigerous, setae short. Pronotum transversely oblong, about a fourth wider than long; sides, subparallel, slightly convergent, almost straight, feebly arcuate, anteriorly broadly and very feebly sinuate posteriorly, margin rather thick; apex broadly emarginate, subtruncate in middle third, not at all beaded; apical angles rather broad, anteriorly prominent and rather more than narrowly rounded; base arcuate in middle third, broadly and feebly sinuate laterally, margined and with a submarginal groove; basal angles rectangular to almost less than a right angle and somewhat prominent laterally; disk broadly and less than moderately convex, most so centrally, slightly impressed at the apical and basal angles, puncture rather coarse, sparse, denser at the angles, smaller in the central area, interstitial surface shining and glabrous. Elytra rather less than twice as long as wide, punctures sparse, not sharply defined, surface more or less rugulose; margin slightly reflexed, rather narrow and with a distinct but narrow gutter; sutural angles rounded. Epipleura horizontal, moderately wide, inflexed at apex at the beginning of the apical curve, inner margin evanescent without convergence to the outer margin; gradually widened from the humeral angles. Abdomen finely punctured, pubescence denser and recumbent.

Male.—Comparatively less broad. Basal pronotal angles more prominent laterally, tips not rounded. Fifth ventral abdominal segment truncate, sometimes slightly impressed at middle of the apex so as to appear feebly sinuate.

Female.—Broader and stouter. Basal angles of the pronotum less prominent and slightly blunt.

Length 2.5–3.5 mm.; width 1.0–1.6 mm.

Type locality.—Tonopah, Nevada.

Holotype, male, and allotype, female, in my own collection; paratypes in the collection of the California Academy of Sciences. Twenty-four specimens

studied. Taken by Mr. F. W. Nunenmacher in July from the blossoms of an undetermined species of plant.

Hirsutus approaches *oblongus* Casey from Utah. It cannot be the same. In the latter the apical angles are acute, pronotum finely punctate, frontal impressions pronounced, legs pale rufo-ferruginous, sides of the pronotum extremely feebly arcuate from base to apex. In *hirsutus* the epipleura are inflexed apically and it therefore agrees with *ursinus* Casey. The specimens of *hirsutus* before me constitute a very homomorphic series and vary only in size.

NOTES ON THE LIFE-HISTORY OF PACHYPSYLLA CELTIDIS-GEMMA RILEY.

BY HARRY B. WEISS,
New Brunswick, N. J.

This species, which was described by Riley in 1884 (Proc. Biol. Soc. Wash. II, p. 74) is locally common in New Jersey, the nymphs forming galls on the twigs of hackberry (*Celtis occidentalis*). These polythalamous galls are deformations of the young buds. They are variable in size and irregular in shape but always bud-like or subglobular and appearing as if formed by a conglomeration of small nodules. Van Duzee (Cat. of Hemiptera, 1917) lists it as occurring in New Jersey, New York, D.C., Va., Ia., Mo., La. and Texas.

The galls are always formed on the new wood and in severe infestations almost every bud is deformed. Each swelling contains from 1 to many cells each of which harbours a nymph. A gall 2 mm. in diameter was found to consist of 1 cell; one of 5 mm. contained 7 cells; one of 8 mm. had 19 cells; one of 9 mm. contained 24 cells and another of 10 mm. had 22 cells. These cells are grouped so that each has a part of the outside wall of the gall covering it. The cells are irregularly oval to subcircular in shape and vary considerably, depending on the sizes of the nymphs occupying them. Galls containing only a few nymphs appeared to have relatively larger cells.

Overwintering takes place in the last nymphal stage, these nymphs emerging through somewhat irregular to regular elliptical openings in the wall of the gall during the last few days of May and the first half of June. These nymphs crawl on the tops of the galls and to the twigs and adults emerge shortly afterward. During the first two weeks of June at Riverton, N. J., where most of the observations were made, adults were plentiful on the stems and leaves of hackberry. Feeding appears to take place chiefly on the petioles of the leaves and on the tender stems, the adults resting head downward. Copulation and egg deposition occur shortly after emergence. Females reared in a cage deposited eggs before taking any other nourishment except that afforded by the dry stems, which was apparently next to nothing. The eggs are deposited on their sides on the lower leaf surface close to a vein or in the angle formed by two veins. Sometimes they are found on the developing shoots or in crevices around the bases of leaf petioles. They are held fast to the leaf or other surface by means of a short backward projecting stipe, arising near the basal end, which is inserted in the tissue. The basal part of the leaf, where the pubescence in the vein angles is thick appears to be a favoured place for eggs. Many eggs are deposited singly and many in groups ranging from 2 to 8 or 10.

It is not known how long it takes for the eggs to hatch. First stage nymphs were not found in the buds until July 20. At this time the buds were not appreciably deformed. From this it appears that over two weeks are necessary. After hatching the nymphs make their way to the small developing buds, crawling between the folded parts and locating in a spot between the centre and the outside of the bud. At first the young nymph is somewhat greenish, but later assumes a yellowish tinge. On September 1, or over a month later an examination of numerous well-defined galls showed nymphs in all stages of growth except the first and the last stages. By the middle and last of September many last stage nymphs were found.

The cells containing the nymphs appeared to be unevenly and thinly lined with a white cottony material. This material increased in bulk as the last stage was approached, and cells containing nymphs of this stage usually had quite a pad of material on that part of the cell directly over the back of the nymph. The hairs on the dorsal part of the body also were covered with the cottony down.

The nymphs collected during the season were easily arrangeable into 5 stages based on their size, but the exact number of instars is not known, due to the difficulty of keeping the same nymph under observation throughout the season. Brief descriptions showing development of the nymphs, are given below. The bodies of the nymphs of all stages are capable of considerable distension, and specimens showing the same dimensions of the head and wing parts vary greatly in the sizes of their bodies, due no doubt to the amount of food in them at a given time.

In addition to the references to this species which are given in Van Duzee's Catalogue, the following one may be noted—Felt., Key to American Insect Galls, N. Y. State Mus. Bull. 200, 1917 (1918), p. 23, fig. 127.

Egg.—Length 0.3 mm. Width 0.1 mm.

Pearly white, smooth, elongate sub-pyriform, rounded at basal end and tapering to acute point at opposite end which bears a fine hair about $\frac{1}{3}$ as long as the egg. Widest across basal third. A short, backward projecting stipe arises from near the basal end.

First nymphal stage. Length 0.3 mm. Width of head between eyes 0.1 mm.

Colour lemon yellow; oval, broadest across thorax, abdomen tapering slightly; body flat dorsally or slightly convex, segmentation indistinct. Antennæ whitish, short, projecting; eyes red; median dorsal light line running through head and thoracic segments. Dorsal surface of head evenly and lightly browned, posterior to this area are 2 transverse light brown bands on the thorax and posterior to these bands are many fine transverse brown lines on the abdomen. Lateral edges of abdominal segments bearing minute spines; last abdominal segment terminated dorsally by a comparatively larger spine. Dorsal body surface bearing several fine, short, erect hairs. Outer surfaces of legs lightly browned. Ventral surface lemon yellow. Rostrum extending to second pair of legs, lancets $1\frac{1}{2}$ to 2 times length of body.

Second nymphal stage. Length 0.4 mm. to 0.55 mm. Width of head between eye 0.18 mm.

Yellowish, broadest across thorax. Somewhat similar to first stage except that the dorsal brown markings are faint or absent; anterior margin of head truncate; sides of thorax arcuate; abdomen more elongate, sides rounded and extrem-

ity abruptly tapering to point; dorsal hairs more pronounced; abdominal segmentation more distinct. Legs whitish. Sizes of individuals vary greatly. Some specimens suboval in outline, many elongate, some with greatly distended bodies.

Third nymphal stage. Length 0.7 mm. to 0.8 mm. Width of head between eyes 0.26 mm. Form elongate.

Lemon yellow to orange with faint transverse dorsal markings. Antennæ and legs whitish. Thorax subquadrate; sides of abdomen subparallel or strongly arcuate, with pointed tip. Sides of 2nd and 3rd thoracic segments slightly produced laterally and somewhat posteriorly. Extremity of abdomen brownish. Segmentation more distinct than in preceeding stage. Extremity of abdomen terminating in 2 minute spines or processes directed upward. Dorsal surface of body especially posterior portion of abdomen bearing numerous fine erect hairs.

Fourth nymphal stage. Length 0.91 mm. to 1.34 mm. Width of head between eyes 0.38 mm. Shape somewhat similar to that of preceeding stage.

Somewhat chunky. Colour lemon yellow with faint transverse orange markings. Last 3 abdominal segments closely united and brownish. Antennæ whitish with faint brownish bands. Thorax subquadrate, sides of abdomen strongly arcuate. Insect widest across abdomen. Abdomen flat or subglobular. Wing-pads whitish, much more prominent and larger and strongly directed laterally and slightly posteriorly. Legs whitish, articulations dark. Hairs on head, thorax and abdomen more pronounced, those on abdominal segments long and arranged in transverse rows.

Fifth nymphal stage. Length 1.8 mm. to 2.3 mm. Width of head between eyes 0.6 mm. to 0.7 mm. General colour yellowish with faint orange to red transverse markings. Wing pads, legs, last three abdominal segments brownish. Antennæ sparsely hairy, about as long as width of head and banded alternately with white and brown. Eyes prominent, lateral, red. Head transverse with an irregular brown spot on dorsal surface either side of middle. Thorax subquadrate in distended specimens. Wing-pads of meso- and metathorax extending posteriorly to second abdominal segment. Abdomen subglobular, sides strongly arcuate. Body widest across abdomen. Abdomen consisting of 8 segments, last 3 strongly chitinized, dark brown, terminating in a point; abdominal segmentation pronounced, except in last 3 segments which appear to be somewhat fused. Abdominal segments 6, 7 and 8, especially 7 and 8, bearing numerous minute tubercles each bearing a hair. Anal segment consists of a horny process bearing minute teeth or tubercles at its base. Dorsal surface of body, especially posterior part of abdomen, bearing fine white hairs. Legs brownish, light on ventral surfaces. Tibiæ bearing several minute spines and hairs. Ventral surfaces of thorax and abdomen yellowish or yellowish red except for several pairs of median, brownish abdominal spots and the dark markings of last three segments. Rostrum extending to between 1st and 2nd pairs of legs, tip dark.

During the last of May and first part of June the dorsal surface becomes bluish green with orange to red markings. Together with the dark areas, this gives a very attractive appearance to the nymph. The abdomen swells, becomes circular in outline, and the narrowest part of the body is across the 1st abdominal segment. The first 5 abdominal segments become bulged and slight tubercular processes appear on the sides. Many of the specimens measure 3 mm. in length and 1.8 mm. across abdomen at this time.

SOME BRITISH FOSSIL INSECTS.

BY T. D. A. COCKERELL,

Boulder, Colorado.

Carabites scoticus, n. sp. (fig. 28.)

Elytron 5 mm. long, 2 mm. broad, inner basal corner rectangular, margins very slightly convex except at apex and outer base; ten striae, not counting the inner absolutely marginal one, outermost stria marginal except near base, striae appearing sharp, but under a high power seen to be weakly and closely punctate; third and fourth striae (counting from inner margin) uniting at a distance from apex about five times as great as the distance between striae.

Eocene rocks, Island of Mull, with a series of plants now being described by Professor A. C. Seward. The beetle elytron, which is in the collection at Cambridge University, will be recorded in Professor Seward's paper on the plants, but it seems best to describe it in an entomological journal. There are in the collection two other elytra, too imperfect to describe. One is at least very close to the above; the other is smaller, about 3 mm. long, weakly striate, and is apparently a weevil. *C. scoticus* is in general much like *Anchomenus fuliginosus* Pz., but it lacks the series of strong marginal punctures. It is quite distinct from the Eocene beetles of the south of England.

This is the first tertiary insect from Scotland to receive a name, but J. S. Gardner (Quart. Journ. Geol. Soc., XLIII, pl. XIII) figured a much larger elytron and a hind wing of an Homopterous insect from the I. of Mull beds.

Pseudosiricidæ.

Megapterites mirabilis Ckll. (Ann. Mag. Nat. Hist., March, 1920), from the Eocene of Bournemouth, is the only Tertiary representative of this family. It is a large insect, the anterior wing about 50 mm. long. Its nearest relative, apparently, is *Formicium* of Westwood, from the Lower Purbeck of Durdlestone



Fig. 26.

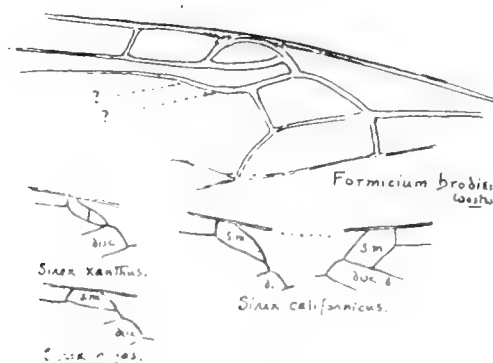


Fig. 27.



Fig. 28.

Bay. The type of *Formicium brodiei* Westw. is in the British Museum, where I have recently examined it. At the same time, the type of *Megapterites* was re-examined in company with Mr. Tillyard, whose keen eyes detected some features in the marginal cell which I had overlooked. After careful examination in a good light, following Mr. Tillyard's suggestions, I must agree with him that the marginal cell is closed and appendiculate at end, and has a cross nervure (in the manner of *Sirex*) not far from the base. It also appears that the original

figure of *Formicium* requires revision, and I give a new one, showing what can actually be seen. The dotted lines followed by ? are probably no more than folds or creases. Presumably there was at least one transversocubital nervure, but it could not be seen.

Comparing these wings with the modern Siricidæ, they are so close that it is not certain that a distinct family is indicated. Probably a subfamily, Pseudosiricinae, contrasting with the living Siricinae, would suffice for the fossils. *Formicium* appears to differ strikingly from *Megapterites* in the first submarginal cell, which is entirely separated from the first discoidal, and looks as if it belonged to the marginal series. In *Megapterites* the first submarginal is broadly sessile on the first discoidal, as in most Hymenoptera. The arrangement in *Xeriscaudatus* Cress. is not very different from that of *Megapterites*, but *Sirex gigas* L. has the first submarginal separated from the discoidal, much as in *Formicium*. The marginal cell in *Sirex* may be distinctly closed, as in *Megapterites*, or may be open by the fading away of the apical region. A specimen of *Sirex xanthus* Cam. has the first submarginal touching the discoidal on both sides, and on one side the submarginal has a cross-vein, purely an aberration. But the most remarkable specimen is a *Sirex californicus* Norton, the two sides of which are very different, one having the first submarginal broadly sessile on the discoidal, the other having these cells separate. There are other abnormalities in the wings of this insect, but they do not concern our present problem.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO—ANNUAL MEETING.

The Fifty-seventh Annual Meeting of the Entomological Society of Ontario was held at the Ontario Agricultural College, Guelph, on Wednesday and Thursday, November 17th and 18th, 1920, and was well attended, there being present, in addition to members and visitors from various Provinces and others from the staff of the College, several distinguished entomologists from the United States. The following members were present: Dr. E. P. Felt, State Entomologist, Albany, N. Y.; Rev. Prof. C. J. S. Bethune, Prof. L. Caesar, and Messrs. A. W. Baker and G. J. Spencer, O. A. College, Guelph; Messrs. A. Gibson, L. S. McLaine, H. G. Crawford, and E. Hearle, Dominion Entomological Branch, Ottawa; Prof. W. Lochhead, Macdonald College, Que.; Father Leopold, La Trappe, Que.; Mr. F. J. A. Morris, Peterborough, Ont.; Prof. E. M. Walker, Toronto, Ont.; Mr. W. E. Biggar, Hamilton, Ont.; Mr. Jas. Dunlop, Woodstock, Ont.; Mr. E. R. Buckell, Dept. of Agriculture, Victoria, B. C.; and the following officers of the Dominion Entomological Branch: Messrs. C. E. Petch, Hemmingford, Que.; W. A. Ross, Vineland Station, Ont.; H. F. Hudson, Strathroy, Ont., Norman Criddle, Treesbank, Man., and E. H. Strickland, Lethbridge, Alta. Among the visitors present were Prof. C. R. Crosby Cornell University, Ithaca, N. Y.; Messrs. W. R. Walton and L. H. Worthley Bureau of Entomology, Washington, D. C.; Mr. A. V. Mitchener, Manitoba Agricultural College, Winnipeg, Man.; Mr. A. H. McLennan, Dept. of Agriculture, Toronto; Mr. R. H. Gurst, Dominion Pathological Laboratory, St. Catharines, Ont.; and Professors R. Harcourt, J. E. Howitt, D. H. Jones and J. W. Crow, Dr. R. E. Stone, and Messrs. C. R. Klinck, and W. G. Garlick, O. A. College, Guelph, Ont.

On Wednesday a meeting of the Council was held, at which, among other matters discussed, it was decided to hold the next Annual Meeting at Toronto. A committee, consisting of the President, Dr. Walker and Mr. Baker, was appointed to consider the state of the Society's finances. The general session commenced at 1.30 p.m., the President, Mr. Arthur Gibson, occupying the chair. After the presentation of the Reports of the Council and the various officers and branches of the Society, the following papers were read:

Notes on Leaf Bugs (Miridæ) Attacking Apples in Ontario—Prof. L. Caesar.

The Manitoba Grasshopper Campaign, 1920—A. V. Mitchener.

Some Phases of the Present Grasshopper Outbreak in Manitoba—N. Criddle.

The Influence of Locusts on the Ranges of British Columbia (with lantern slides)—E. R. Buckell.

The Beet Webworm Outbreak of 1920—E. H. Strickland.

Paris Green should be discontinued as an Insecticide—Father Leopold.

The Present Status of the Hessian Fly in Western Ontario—H. F. Hudson.

Insects of the Season in Ontario—L. Caesar.

On Wednesday evening a meeting, in the form of a smoker, was held in the men's sitting room of the College Residence, at which Prof. Lochhead acted as chairman. The two principal events of the evening were a masterful address by Dr. Felt, entitled "Some of the Broader Aspects of Insect Control" and the third part of Mr. Morris's delightful "Life-history of a Hobby Horse." Both of these papers were much enjoyed by those present. Dr. Felt's paper was a very able presentation of his subject, while Mr. Morris captivated his audience by the charm of his language and delivery, and the fine scholarship and whimsical humour, which characterized his address. The meeting was enlivened by several musical selections played by the College Orchestra.

On Thursday morning the session was commenced with the election of officers for the ensuing year, with the following results:—

President—Mr. Arthur Gibson, Dominion Entomologist.

Vice-President—Mr. F. J. A. Morris, Peterborough.

Secretary-Treasurer—Mr. A. W. Baker, O. A. College, Guelph.

Curator and Librarian—Mr. G. J. Spencer, O. A. College, Guelph.

Editor—Prof. E. M. Walker, Toronto.

The following papers were then read:—

Further Evidence of the Effectiveness of Mercury Bichloride in the Control of the Cabbage Root Maggot in British Columbia.—R. C. Treherne and M. H. Ruhman.

Some Further Data on the Cabbage Maggot—L. Caesar.

Interrelations in Nature—W. Lochhead.

The Control of the Rose Midge—W. A. Ross.

Discussion of the European Corn Borer. This symposium was one of the chief features of this year's meeting. It was opened by Messrs. Arthur Gibson and L. S. McLaine on the outbreak of this pest in Ontario, and was followed by Messrs. L. Caesar, H. G. Crawford, W. R. Walton, L. H. Worthley and E. P. Felt.

Some Mosquito Problems in British Columbia—E. Hearle.

Wohlfahrtia vigil, A New Sarcophagid Parasite of Man—E. M. Walker.



PROF. E. M. WALKER, M. D.

The Canadian Entomologist

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No. 2

RETIREMENT OF DR. E. M. WALKER AS EDITOR.

Owing largely to increased duties, Dr. Walker has found it necessary to tender his resignation as Editor of the Canadian Entomologist. When his esteemed predecessor, the Rev. C. J. S. Bethune, found it necessary to relinquish the editorial duties, the Council of the Entomological Society of Ontario was fortunate in persuading Dr. Walker to take up this work. Dr. Walker has served the Society and entomologists generally for a period of eleven years in a most faithful and painstaking manner, and as President of the Society I feel that I am voicing the opinion of all our members and subscribers in recording here our warm appreciation of his valued services during such a long period. Dr. Walker has enriched to a marked degree the literature relating to Canadian insects, and in view of his personality and his attainments he is held in high regard, not only by entomologists resident in Canada, but by those of other countries as well.

The duties of an editor are not always along paths strewn with roses, and for this and other reasons one sometimes wonders why any person is persuaded to edit a scientific journal. The true reason, of course, is a love for the work for its own value and the effort to assist in the general advancement of the science. Dr. Walker has certainly conducted his duties in a most pleasing and acceptable manner. We wish him further success in the important work he is doing at the University of Toronto.

As mentioned in the January number, Dr. J. H. McDunnough, Chief of the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa, Ont., has been appointed Editor in place of Dr. Walker. Dr. McDunnough has a wide reputation as an entomologist, and the Society is fortunate in securing his services.

ARTHUR GIBSON.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE-HISTORY OF A HOBBY HORSE.

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART. II.—BOY AND MAN—SAPLING GROWTH.

(Continued from page 5, Vol. LIII.)

Slyboots and I had already suffered a partial separation; he attended a school at Gypsey Hill, while I was entered at Dulwich College. Among his teachers was Theodore Wood who gave lessons in Entomology, and it was at this time that we acquired his kinsman's books on British Moths and on Beetles, and thus laid the foundations of a little library including Coleman's Butterflies, Atkinson's Birds' Eggs and Nests, and a work illustrating Spiders, Dragonflies, Wasps and other Insects, which has long vanished, even to its author's name.

Among my brother's schoolmates was one whose life ambition was to be a doctor, and already at 15 he took his profession and things in general very seriously. In the newcomer's friendship I had of course some share—a jackal's if not a lion's—and was allowed to attend the séances held in a room over his father's coach-house. These séances were mostly of a chemical character, accompanied by mephitic odours and ending in loud, glass-flying explosions. Various creatures, birds and mammals, were boiled down and their bony anatomy taken apart and then carefully reconstructed. His greatest treasure was a human skeleton, begged, borrowed, and bought piecemeal and with great trouble; it was far from perfect and some of the parts had been contributed (without their consent) by lower animals; it was not even entirely of one sex, and its age varied from a small boy's to an old woman's. This monstrous apparition occupied a kind of dias at one end of the attic and never failed to lend an atmosphere of awe to this young Sawbones' feasts of reason.

It was under his guidance that we made our way to quite distant points in the country side, Streatham Common, Epsom, stretches of the river Mole by Box Hill and Leatherhead, and Carshalton with its beautiful reaches of the river Wandle, subject of one of Ruskin's most eloquent laments. His favorite out-door hobby was fossil-hunting, and it was by that avenue that we were led to our first view of the chalk downs near Caterham Junction. We took train to Croydon and then tramcar a mile or two beyond. Here lay some chalk pits in the side of a broad expanse of rolling heath. Many a long hour in the dazzling glare of the chalk did we spend, digging out sea-urchins, trilobites, ammonites, anemones, sponges, corals, and shark's teeth from the walls of the pit, or raking over refuse heaps. And, of course, it was not long before we discovered how interesting were the downs that had covered this prehistoric chalk bed with new and varied life. There were numbers of stone-chats, and plovers, and larks about the thickets of gorse; once a hare being coursed, with backward-staring eyes, sprang full against my legs as it mounted the hillside. On the downs we captured several "hair-streaks" and "chalk-blues" that were entirely new to our collection, and on the homeward trip one day we had an encounter that capped them all for thrills.

We had made our way down from the breezy heath into a hollow road with high, uncut hedges on either side, and presently the road widened out into two, an upper gravel road and a low wagon track, with a gentle slope of short grass between. Up and down about this turfy space went flights of the most beautiful creatures we had ever seen; they flew low and somewhat heavily, an easy mark for the net. The forewings were deep indigo-green with large spots of rich crimson, the hindwings entirely crimson, both pairs long and narrow, gently rounded at the apex. It proved to be the 6-spot Burnet Moth, one of the *Zygænidae*, a family not very well represented on our continent of North America.

The astonishing beauty of these Burnet Moths in the sunlit lane has helped to impress the whole scene of this first encounter indelibly on the mind. Even now as I bend my thought steadily on this remote point of the past, every detail of the road stands out again like some invisible ink under the action of sunlight.

The wild luxuriance of the uncut hedges, festooned with bryony and traveller's-joy, and gay with roses, the widening roadway with a grassy space in the middle, the flash of discovery, the eager chase, the triumph of capture, all comes back to me, even to the figure of the boy kneeling over his net in the turf, and presently, as the scene is thus unrolled before me, like something laid away in lavender and fresh from memory's store-room, from its inner folds a most wonderful fragrance comes wafted to me over 36 years till the whole air is redolent with it, and I know that wild thyme must have been blowing all about that grassy bank where these fairy birds of Paradise were flying.

A rarer treat than all these trips of our own planning was a visit to our cousins in Chislehurst. This always meant a day teeming with excitement and netting us many a rare addition to our cabinet. The very moment we entered my uncle's big kitchen garden on our initial visit, we spied the first real live Peacock butterfly we had ever seen, sailing down towards a patch of "live-for-ever"; this bed of orpine proved a regular paradise of a hunting ground, where we captured Brimstone butterflies, Red Admirals, Tortoiseshells, and Peacocks in dazzling succession. Upon the enclosing walls of the kitchen garden were trained the spreading branches of various fruit trees, pear, cherry, peach, apricot and nectarine; and all about among the clustered blossoms and fruit hung bottles and other contrivances for catching insects; these were all carefully examined and several new specimens of beetle or wasp or moth or butterfly fished out; most of these traps were filled with liquid, and the lepidopters were spoiled, but here and there hung a kind of glass cage in which live prisoners could be seen still fluttering.

After exhausting for the nonce all the treasures of this Eldorado we passed out of a postern gate in the wall to a gymnasium on the edge of a small wood. Here while rummaging about I discovered a great rarity—the only genuine English hornet I have ever clapped eyes on; it was lying in a clutter of cobwebs at the corner of one of the tall windows, stark dead, but a perfect specimen for the cabinet.

This first visit to Foxbury was, I really believe, unparalleled for the range and splendour of its captures. And before we returned home each of us had another windfall of luck to his share; Slyboots went hunting along a privet hedge not far from the kitchen garden, and presently excited shouts of some wonderful prize brought me tearing across one of my uncle's pet flower beds from the heart of the shrubbery. An enormous caterpillar, striped and horned, of vivid green, was the cause of the outcry, and after gloating over it in envious admiration, I set to work feverishly searching an adjoining hedge. And fortune certainly proved lavish to both of us that day, for each took two more specimens busy feeding on the privet; they were all much of a size, though hardly of the same brood, unless the mother moth had laid its batch of eggs at widely different points.

In about four days they stopped feeding and pupated, but I cannot recall more than one emerging from the chrysalis as a mature Privet Hawk moth. Almost more wonderful than the plumage and spread of pinion of these miniature hawks was to watch the great larvæ feed and crawl. The skin was translucent

and you could see the movements of breathing and circulation quite plainly under the surface. During the active feeding the creature, I recall, when handled, gave a decidedly pleasant sense of contact, being plump, firm, and of remarkable coolness; when full fed, the skin hardened and became opaque.

It was on this visit, too, that we found the nests of the Lesser Whitethroat and the Spotted Flycatcher, the latter cunningly hidden under the thatched eaves of a cow-byre; over our heads in the oak wood we spied the beautiful long-tailed tit, and at our feet among the hazels great patches of wild hyacinth—the English “bluebell,” so different from the Scotch flower of that name—the harebell. And on the way home in the growing dusk, as we passed down a lane between hawthorns and a chestnut grove, I was attracted by a rustling in the bushes, and presently the giant body of a beetle issued from the top of the hedge and launched itself into airy flight; the capture of this magnificent creature, an antlered male of the European stag-beetle *Lucanus cervus*) was for me the top-rung in the whole ladder of climbing wonders this day had lifted up before us.

We did not often make a visit to Chislehurst, but whenever we went we added some treasure of discovery. One showery afternoon I remember, I found clinging to the long grass blades in a hay-meadow my first specimens of the Orange-tip butterfly, and the Marbled White, an insect unknown in Scotland; again, on a brilliant day of July, just after lunch, I spied among the oaks a Purple Emperor, and after more than an hour's anxious watching was able to seize a lucky instant of its powerful flight and sweep it into the net from near the base of its imperial throne. These oak woods were a favorite haunt of the Night-jar or Goat-sucker, and on warm summer nights I often lay awake listening to the prolonged churring music of the bird; a sound that haunts the memory as lingeringly as the note of the Perthshire corncrake or the weird challenge of our Whip-poor-Will, its next of kin on this continent. Like the Night Hawk and the Whip-poor-Will, the bird rests lengthwise on the limb of a tree, and so perched, spins out its long-drawn purring monotone; the slightly ventriloquial character of the sound, they say, is due to the bird turning its head this way and that while singing. The structural affinity of these three birds and their kinship with the Swifts lent a double interest to my first meeting with the two American cousins of our British Night-Jar.

Before we had been three years in England, Slyboots set sail for Australia, and Merry Andrew was thrown once more on his own resources. School studies had already begun to claim most of my spare time, and the collection made little progress; once I captured a magnificent Muskbeetle, the only Longicorn with which I was familiar as a boy; once a visit to the South coast brought me into contact with the Clouded Yellow butterfly, whose powerful flight and wariness taxed all one's skill with the net; and a stay near Oxford secured me three or four new species of dragon-fly. But the boyish interest in collecting waned fast, and when our whole cabinet was stolen from a warehouse at Malvern during my freshman year at Oxford, regret at the loss of all these treasures so laboriously gathered and so lovingly guarded was deplorably quick in the passing.

(To be continued.)

THE NERVOUS SYSTEM OF THE LARVA OF *STHENOPIS THULE*
STRECKER.BY J. M. SWAINE,
Entomological Branch, Ottawa.

(Continued from p. 283, Vol. LII.)

COMPARATIVE STUDIES OF THE LARVAL NERVOUS SYSTEM IN LEPIDOPTERA.

A Summary.

A comparison of the nervous system of the larvæ of the Jugatæ with that of other caterpillars of the Lepidoptera and Trichoptera reveals several interesting conditions, two of which appear to have special significance.

It is not proposed to generalize too freely from the results of these few dissections, but rather to suggest that the well defined differences in the larval nervous system may be worth more exhaustive treatment in connection with the study of the phylogeny of the group. It may be that the larval nervous system in the Lepidoptera and Trichoptera has been less modified throughout the evolution of the groups than has any other organ of either larva or adult, and since the characters exhibited are so distinct that in some cases genera and even species may be determined from them, the evidence they present must be of value. Dissections of determined larvæ throughout the Trichoptera and in the lepidopterous families Nepticulidæ and Prodoxidæ, examples of which were not available to me at the time, should prove of special interest.

The Lepidoptera were divided by Professor Comstock into two sub-orders, the Frenatæ and the Jugatæ, the latter comprising the two families Hepialidæ and Micropterygidæ. Judged by the characters of the adult the members of the Jugatæ were considered to be the most primitive of the Lepidoptera; and the study of the pupal wing-venation of *Sthenopsis thule* by Dr. MacGillivray supports this view. The most recent catalogues of the North American Lepidoptera do not recognize this subdivision into Frenatæ and Jugatæ but place the families Hepialidæ and Micropterygidæ as the lowest of the order. Still more recently the Micropterygidæ have been included with the Trichoptera.

It is, therefore, of considerable interest to find that the larval nervous system of *Sthenopsis* and of one species of the Micropterygidæ are closely similar in the two most prominent characters and are far more widely separated from all the Frenatæ, as represented in our dissections, than are any two families of these so-called higher Lepidoptera from each other; that in one respect at least they are much more highly modified; and, further, that the larval nervous system of the Trichoptera agrees most closely in these characters with the higher families of the Frenatæ.

The larval stages of the primitive stock from which both Lepidoptera and Trichoptera have descended must surely have had a nervous system of a primitive type, and from this the nervous systems of our modern caterpillars and caddice-fly larvæ must have been derived.

Since the nervous system of primitive insects apparently included a double chain of ganglia, longitudinal connectives and transverse commissures throughout the length of the thorax and abdomen, with at least one pair of ganglia in each abdominal segment, evidence of advanced modification should be indicated

by cephalization of the abdominal ganglia and by adhesion and fusion of the longitudinal connectives. We should, therefore, expect to find the Jugatæ exhibiting a tendency towards retaining a larger number of abdominal ganglia and showing a lesser degree of fusion of the connectives, with the opposite tendencies becoming more strongly marked in the higher families of the Frenatæ. In the Rhopalocera at least we should expect to find a decided advance over the condition found in the Jugatæ. The actual condition is that the Jugatæ have one more abdominal ganglion, and are in that respect more primitive; but, on the other hand, they are infinitely more highly modified in that both the thoracic and abdominal connectives are completely fused for their entire length.

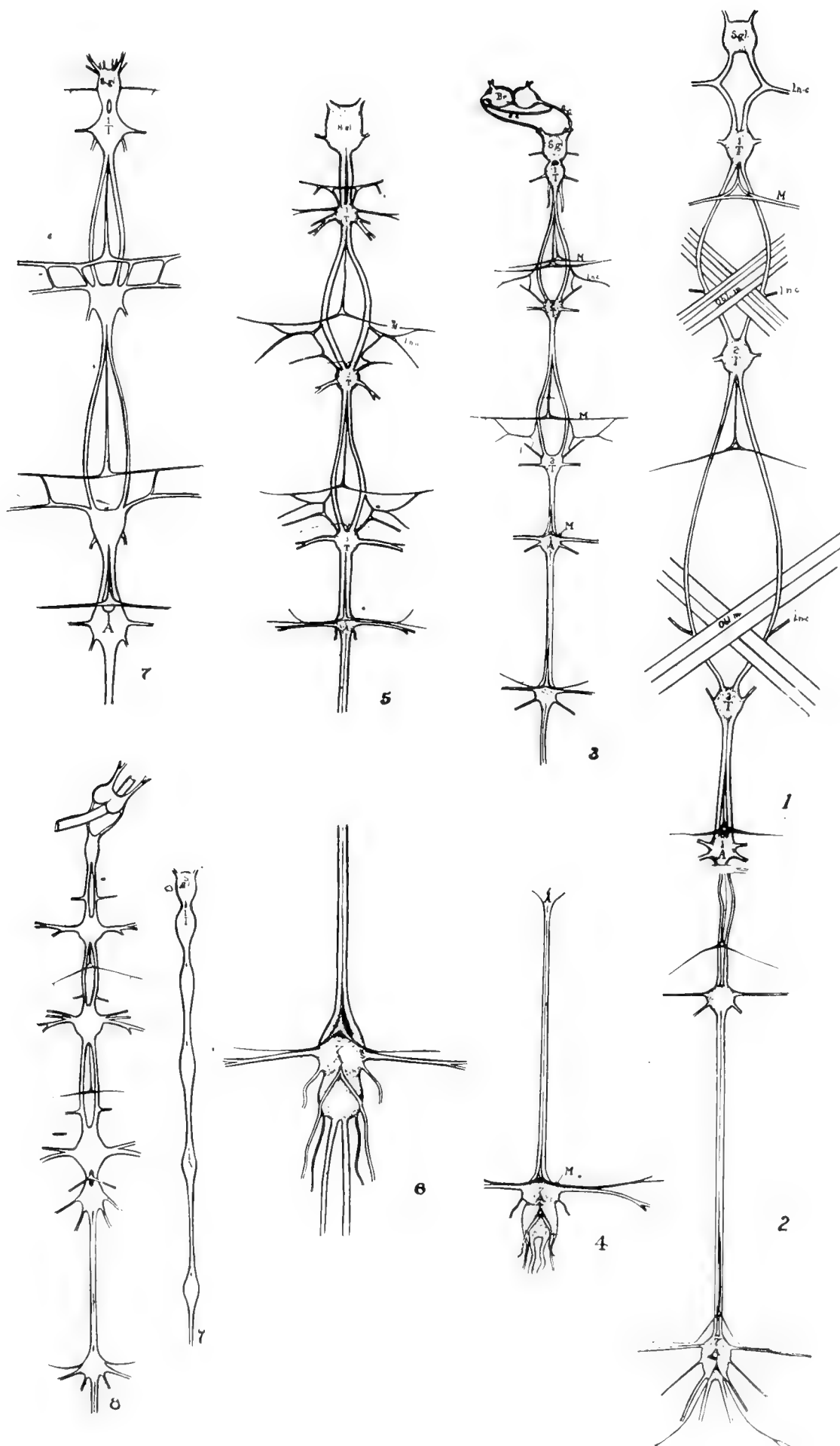
It is usually assumed that the Lepidoptera and Trichoptera are closely related in origin, and that the latter approximate more nearly to the original ancestral type from which both orders have apparently arisen. We should, therefore, expect the larval nervous system of the caddice flies to be more nearly like that of the lowest families of the Lepidoptera. It is interesting to find that the exact opposite is the case; the Caddice flies, as represented by the species dissected, approximate most closely in this regard to the Rhopalocera, and the Hepialidæ and Micropterygidæ stand out together remarkably distinct from both the Frenatæ and the Trichoptera.

In all the Frenatæ the connectives in the last two thoracic segments are widely separated, with the oblique muscles passing out between them. This, supposedly a primitive character, is especially prominent in the Rhopalocera, but occurs throughout the subfamily. Even in the abdomen the double origin of the connectives is indicated by an impressed median line, apparently throughout the Rhopalocera, in the Sphingidæ, and variably in other families of the Frenatæ. In the Jugatæ, however, as represented by the two species of *Sthenopsis* and the eriocranid I have studied, these connectives are absolutely fused throughout the thorax as well as in the abdomen. When it is considered that this modification also involves a great alteration in the relations between the connectives and the oblique muscles of the thorax, it would appear that these larvæ of the Jugatæ are in this important character very much more highly modified than any of the Frenatæ.

On the other hand, the larvæ of all the Frenatæ appear to be more highly modified than those of the Jugatæ in that they have only seven abdominal ganglia in the ventral chain, although the last, the seventh, is always evidently composite, and in some groups partly divided into two ganglia. In *Sthenopsis*, and also in the eriocranid dissected, there are eight abdominal ganglia, the last evidently composite.

The Trichopterous larvæ dissected have only seven abdominal ganglia and have the connectives in the thorax widely separated throughout their length, much as in the Rhopalocera.

The highly modified condition of the thoracic connectives indicates that the Jugatæ were separated from the main stock, from which the Lepidoptera and Trichoptera were derived, at a very early period, even before the separation of the Trichoptera and, following a different line of development, have retained markedly primitive characters in the wing-venation of the adult and the eight distinct abdominal ganglia in the ventral chain of the larva, although



NERVOUS SYSTEM OF LEPIDOPTERA.

(See page 34.)

passing far beyond all others of their kin in the degree of fusion of the connectives in the larval nervous chain.

Further Details of a Few Dissections.

The nervous system was examined in a series of caterpillars representing all the families available at the time. A brief outline of a few examinations will be sufficient for the present purpose.

Papilio polyxenes Fabr.

Plate II, Figs. 1 and 2.

The condition shown in the figures appeared to be general in the butterflies. The thoracic connectives are widely separated throughout with the oblique muscles passing between them in the 2nd and 3rd thoracic segments, with a lateral nerve from the connectives of all three thoracic segments. The abdominal connectives are separated for a considerable distance in front of each ganglion and their double origin is indicated on the remaining part by a strongly impressed median line. There are seven abdominal ganglia, with the last longer than wide, but not constricted, indicating its double origin only by the number of nerves to which it gives rise.

Ceratomia amyntor Hbn.

Plate II, Figs. 5 and 6.

The infræesophageal ganglion is thick and shows traces of an impressed median line. The connectives between that and the 1st thoracic ganglion are longer than in *Sthenopsis thule* and distinctly separated, though adjacent. Between the 1st and 2nd thoracic ganglia the connectives are widely separated, except for a short distance behind the first ganglion, where they are adjacent. They are distinctly separated at their insertion into the 2nd ganglion. The connectives between the 2nd and 3rd thoracic ganglia are as those between the 1st and 2nd. Those between the succeeding ganglia are adjacent, but distinctly separated. This is a condition far removed from that in *S. thule* with an almost solid ventral cord.

Distinct nerves from the connectives are found between the 1st and 2nd and the 2nd and 3rd thoracic ganglia, but not elsewhere. They are connected with the transverse branches of the median nerves and with the first pair of nerves from the ganglia. The development of the median system is indicated sufficiently for the present purpose in the figure; as usual, it is most highly developed in the thorax. The last ganglion, the 7th abdominal, is elongate and evidently constricted.

Sphinx kalmiæ S. and A.

The ventral cord is similar to that figured for *Ceratomia*, except that the connectives are adjacent in the thoracic segments for almost the cephalic half of their length, and the abdominal connectives are much more completely fused, though still showing a median line. The median and connective nerves of the 3rd thoracic segment are complex, as in *Ceratomia*. The last ganglion is evidently complex, with a distinct constriction.

Sphinx drupiferarum S. and A.

The connectives are more slender in the abdomen than in *Ceratomia*, but still showing everywhere the median line which indicates their double origin. Those of the 1st abdominal segment are about three times the length of the

1st abdominal ganglion, and with the median line very heavily impressed. Those of the 7th abdominal segment are distinctly separated on both the cephalic and caudal thirds of their length. The last ganglionic mass, in the 7th segment, is in the form of two distinct ganglia, the last, or 8th, being separated from the 7th by extremely short but evident connectives.

Tropæa luna L.

Plate II, Figs. 3 and 4.

The connectives of the 1st thoracic segment are extremely short; the abdominal connectives are impressed along the middle line, and the thoracic connectives are fused for a short distance behind the 1st and 2nd thoracic ganglia.

Eacles imperialis Drury.

The connectives are widely separated between the subœsophageal and the first thoracic ganglia, widely separated on the caudal half only and adjacent in front in the 2nd and 3rd thoracic segments. In the abdomen the connectives are slender and completely fused except for a narrow but complete separation for a short distance in front of the ganglia. The median line can rarely be traced throughout the length in the abdominal connectives. This condition is in sharp contrast to that found in the Sphingidæ. The last ganglion is very elongate but only feebly constricted at the middle. The median nerve in the 2nd and 3rd thoracic segments is extremely complex.

Schizura concinna S. and A.

In *Schizura* the connectives between the subœsophageal and the 1st thoracic ganglion are short, hardly longer than the 1st thoracic, but separate and apparently without nerves; these latter appear to arise from the 1st ganglion. The connectives between the 1st and 2nd thoracic ganglia are united for the cephalic half and widely separated on the caudal half, with the usual nerve from each side and the oblique muscles emerging between the connectives. The median nerve of this segment is well developed and branches about one-third the distance in front of the 2nd thoracic. The connectives between the 2nd and 3rd thoracic ganglia are widely separated for the entire length, and the median nerves separate about one-third the distance behind the 2nd ganglion. The connectives of the abdominal segments are united, although the median line of union is visible and the two are distinct immediately cephalad of each ganglion. The last two ganglia are closely connected, without visible connectives, but recognizable as two ganglia.

Datana ministra Drury.

The connectives between the subœsophageal and the first thoracic ganglion are distinctly separated and slightly longer than the first ganglion. The next pair of connectives are separated, except for the cephalic eighth or less, and distinctly separated behind at their insertion; the connective nerves arise very close to the ganglion, less than one-half its diameter from it, and the median nerve branches about midway between the ganglia. The connectives in the 3rd thoracic segment are similar, but with the lateral nerves still closer to the ganglia and the median nerve considerably shorter. The connectives of the 1st abdominal segment are shorter, and divided for the caudal half of their length. The remaining abdominal connectives are fused completely, except for the median split in the caudal fifth. The last pair are shorter and divided for

nearly the caudal half. The last, 7th, ganglion is longer than wide, with a slight median transverse constriction, and evidently composite.

Callopistria floridensis Gn.

The connectives between the subœsophageal and the 1st thoracic are short and widely separated. Those between the thoracic ganglia are widely separated for the entire length. The median nerve branches about one-third the distance behind the ganglion. *The lateral nerves of the connectives are pushed backwards so that they arise from the base of the connective as it leaves the ganglion, and therefore appear almost to arise from the front angle of the ganglion itself.* The connectives between the third thoracic and the first abdominal are short and separated on the caudal third. The remaining abdominal connectives are slender, elongate, entirely fused on the cephalic four-fifths, and distinctly separated on the caudal fifth. The median nerves in the abdomen are very slender, degenerate, separating shortly before the ganglion, passing caudad and laterad for a short distance with the first ganglionic nerve of its side. The last two ganglia are united to form an elongate mass, and this is separated from the preceding ganglion by separated connectives not quite so long as the caudal ganglionic mass.

Euxoa ochrogaster Gn.

The connectives between the subœsophageal and the 1st thoracic ganglia are short but separated. The connectives between the thoracic ganglia are entirely separated, and divided by the oblique muscles. The lateral nerves from the connectives are close to the ganglia, those from the first pair arising at the base of the connectives as they leave the second thoracic ganglion, and those from the second pair arising a very short distance in front of the third thoracic ganglion. The median system is highly developed in the thorax. The connectives between the third thoracic and the first abdominal ganglion are less than twice as long as the ganglia and separated for almost the entire length. The remaining abdominal connectives, except the last pair, are fused except for a short distance, about one-sixth the length, immediately cephalad of the ganglia. The last pair of connectives are hardly longer than the last ganglionic mass and are separated for more than the caudal half of their length. The last ganglion is longer than wide and evidently represents the 7th, 8th (and 9th) very completely fused. A delicate pair of nerves arise from the caudal part of the dorsal face, representing the median nerves of the last segment.

Geometridæ.

A geometrid was dissected, an alcoholic specimen of uncertain species. The connectives in the abdomen are more closely united than in most others, and approach the condition found in *S. thule*.

The connectives between the subœsophageal ganglion and the 1st thoracic are short, hardly longer than the 1st ganglion but quite distinctly separated. The connectives between the three thoracic ganglia are separated for almost the entire length, lying side by side for less than a fifth the length behind each ganglion. The median nerves are well developed as are the lateral nerves of the connectives, which arise a short distance in front of the ganglia. The abdominal connectives are thoroughly fused on the cephalic four-fifths of their length, forming a simple cord, but are distinctly though slightly separated for

nearly a fifth of their length before each ganglion, with the well-developed median nerves arising between them well in front of the ganglion. The last two abdominal ganglia are adjoined with an indication of very short connectives.

Prionoxystus robiniae Peck.

Plate II, Fig. 7.

The connectives in the thorax are adjacent for a short distance, and those in the abdomen are split for one-fourth their length in front of each ganglion. There are seven abdominal ganglia, the seventh solid but composite. The median system is very coarsely developed in the thorax.

Micropterygidæ.

Plate II, Fig. 9.

I have been able to obtain caterpillars of one species of this family through the kindness of Mrs. J. D. Tothill. The larva is a miner of *Spiræa discolor* on Vancouver Island. The material was collected by Mrs. Tothill and determined by her as probably belonging to the genus *Mnemonica*. The caterpillars had been a long time in alcohol, and the lateral nerves could not be isolated satisfactorily. The ganglia and connectives were distinct, however, and are represented roughly in figure 9. The thoracic ganglia are very large and the thoracic connectives are thick, rather short and completely fused throughout their length, except for a median impression in front of each ganglion. There were eight abdominal ganglia. So far as this evidence goes, therefore, the Micropterygidæ stand with the Hepialidæ, forming a group very widely separated from both the Frenatæ and the Trichoptera

Trichoptera.

Plate II, Fig. 8.

Only one species of this Order was available at the time; it was an undetermined species belonging to the Phryganeidæ.

The ventral chain agrees closely in its most striking characters with those of the Rhopalocera. The connectives of the thorax are definitely separated throughout their length, giving rise to distinct lateral nerves, and there are only seven abdominal ganglia. Further dissections throughout this order may show very interesting conditions.

PLATE II.

Figs. 1 and 2.—*Papilio polyxenes* Fabr. Part of the ventral chain.

Figs. 3 and 4.—*Tropæa luna* L. Ventral chain of the larva, brain and sub-œsophageal ganglion to the second abdominal ganglion and the last.

Figs. 5 and 6.—*Ceratomia amyntor* Hbn. Ventral chain of the larva, sub-œsophageal ganglion to the first abdominal ganglion and the last.

Fig. 7.—*Prionoxystus robiniae* Peck. Ventral chain of the larva, sub-œsophageal ganglion to the first abdominal ganglion, showing origins and lateral nerves of the thoracic segments.

Fig. 8.—*Trichoptera*.—Ventral chain of an undetermined larva belonging to this order. Brain and ventral chain caudad to the second abdominal ganglion, showing origins of median and lateral nerves.

Fig. 9.—*Micropterygidæ*. Ventral chain of a larva of the genus *Mnemonica* showing only the ganglia and connectives of the ventral chain from the sub-œsophageal to the second abdominal ganglion.

A NEW CLASSIFICATION OF THE ORDER PERLARIA.

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For some years past I have been studying the Perlaria of Australia and New Zealand, about which little has been made known up to the present. Taken in connection with the forms already described from Southern Chile, Patagonia, Tierra del Fuego and the Subantarctic Islands, these insects form a very distinct Notogæan Fauna, clearly marked off from the Perlaria of the Northern Hemisphere and of the Tropics by the fact that it is made up almost entirely of very archaic types. No representatives of the highly specialized Perlidæ (including Perlodidæ) occur in these regions; no Pteronarcidæ, in the strict sense in which that family will be defined in this paper; no Capniidæ, Taeniopterygidæ or Leuctridæ; and only one or two isolated forms of Nemouridæ (genus *Udamocercia* of Enderlein).

In attempting to classify the known Notogæan forms of Perlaria, I have had recourse not only to all available imaginal characters, but also to as careful a study of the individual life-histories as the rareness of most of the forms would permit. I am now able to state that, as regards Australian and New Zealand forms, the classification adopted by me, on imaginal characters only, has been fully tested in the case of the corresponding larvæ, with the result that these latter are found to group themselves into distinct families as readily as do the imagines, so that the two sets of characters taken together form a most useful and easily understood classification.

The most archaic forms of Perlaria extant are to be found in the genus *Eusthenia* and its allies. These have no close relationship with the Pteronarcidæ as defined in this paper, the latter being specialized by the reduction of the mandibles, the approximation of the coxæ of the forelegs, by the loss of the primitive paired abdominal appendages on segments 1-6, (secondary gill-tufts on the thorax and base of abdomen are developed in some genera), as well as by loss of the original palæodictyopterous mesh-work or *archedictyon* in the anal area of the hindwing, and by the presence of a distinct break in the contour of the outer margin of the hindwing, at the distal end of Cu_2 , where the anal fan leaves the rest of the wing. Thus the only primitive characters left to the Pteronarcidæ in common with the Eustheniidæ proper are the form of the tarsal joints, the visible clypeus and labrum and the presence of numerous cross-veins in the distal portions of the forewing. In contrast with this, all the true Eustheniidæ have a primitive larval form possessing five or six pairs of lateral abdominal appendages functioning as gills, on the first five or six segments of the abdomen, but no secondary gill-tufts at all. These primitive paired gills are closely similar to those found in the larvæ of certain archaic Calopterygidæ in the Order Odonata. They are carried over into the imago at metamorphosis, as are the secondary gill-tufts of *Pteronarcys*, but quickly shrivel up. In the imaginal stage, true Eustheniidæ possess an altogether complete set of archaic characters, as follows: In the forewing, a complete *archedictyon* or cross-venation in all parts of the wing, a complete set of cross-veins between Cu_2 and 1A, a radial sector with three or more branches, a first

cubitus with two or more branches, in most genera showing a primitive anteriorly-arching type of branching, and at least three complete anal veins; in the hindwing, the outer margin with a single complete convex contour, without any re-entrant break or angle at the distal end of Cu_2 (this character is unique for

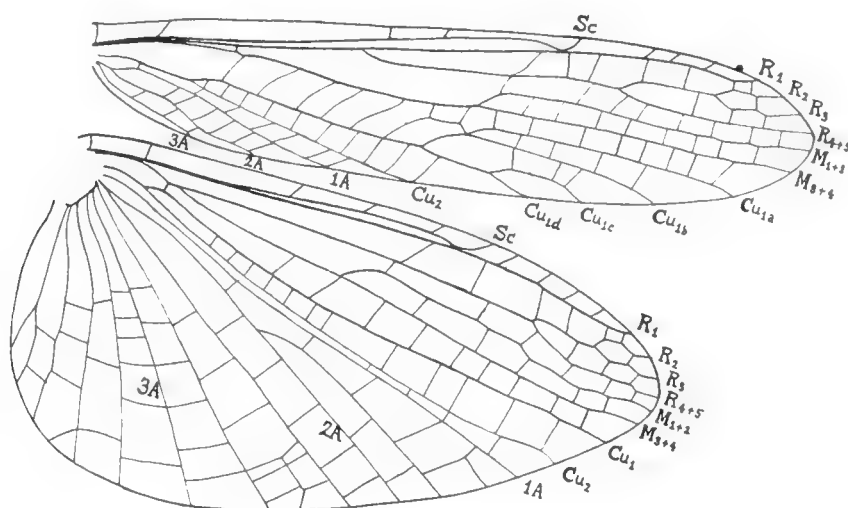


Fig. 1.—Venation of *Stenoperla prasina* (Newm.), family Eustheniidae, (New Zealand). The genus *Eusthenia* itself has broader wings and still denser venation.

the family), the radial sector branched, and the archidictyon completely preserved on the anal fan, as well as on the rest of the wing. (Text Fig. 1*). Other archaic characters are the form of the tarsal joints, the wide separation of the front coxæ, the presence of strong functional mandibles and a clearly visible clypeus and labrum.

Separated from these by clear characters, but still very archaic, are the genera *Austroperla* Needham and *Tasmanoperla* n. g. (type *Eusthenia diversipes*, n. sp.), which differ from the true Eustheniidae in having shorter cerci, somewhat more reduced but still primitive venation, at least a partial fusion of M_{3+4} with Cu_{1a} in the hindwing, no archidictyon on the anal fan, and a distinct re-entrant angle on the outer margin at the distal end of Cu_2 . (Text Fig. 3). In order to test the validity of this family, I sought carefully for larvæ of a different type from those of Eustheniidae, and finally discovered in Tasmania a long cylindrical larva without any gills at all, and with rather short cerci, from which I reared a new species of *Tasmanoperla*, not yet described. Later on, I also obtained a closely similar type of larva from New Zealand, and reared from it *Austroperla cyrene* Newm. Thus the formation of this new family was fully justified.

Numerous species occur in which a considerable measure of specialization has set in, coupled with the retention of a number of archaic characters. These are all closely related to the genera *Leptoperla* of Newman (1839) and *Gripopteryx* of Pictet (1841). They therefore form the family Leptoperlidae, this name replacing the name Gripopterygidae used by Enderlein to include not only these insects, but also the Eustheniidae and Austroperlidae of this paper. Parenthetically, it may be remarked that Enderlein, in forming his family, entirely ignored

*An excellent figure of the wings of *Eusthenia spectabilis* Gray is to be seen in Comstock's "The Wings of Insects," (1918), p. 247, Fig. 246.

Newman's genus, and did not even give it a place in his dichotomic tables, though he must have known of its existence.

The characters that distinguish the Leptoperlidæ, as here defined, (Text. Fig. 4), are the loss of 1A in the forewing, leaving only two anal veins, 2A and 3A, of which the latter is always forked; the cubitus of the forewing either simple or once forked; the absence of archdictyon in the anal area of the hindwing; the presence of the re-entrant angle at the distal end of Cu_2 ; the presence in the hindwing of a fusion of M_{3+4} with Cu_1 for part at least of their lengths; the possession, as in Eustheniidæ and Austroperlidæ, of the archaic type of tarsal joints, mandibles, clypeus and labrum, and the widely separated front coxæ. In the larvæ, there is a unique development of a rosette of gill-filaments around the anus; no other type of gill is present.

There remain over only a few very reduced forms of Nemouridæ, found equally in Australia, Tasmania, New Zealand and Southern Chile, of which the genus *Udamocercia* End. contains at present the only described species. These are true Nemourids in the widest sense, the imagines having the cerci reduced to one joint, while the same is true for the larvæ, which also have no visible gills.

Owing to a fortunate meeting with Mr. Nathan Banks, of the Museum of Comparative Zoology at Cambridge, Mass., I have recently been able to discuss my plan of classification for the Notogæan Perlaria with him, and to learn from him more details of the morphology of those genera not represented in our Southern fauna than was possible with the limited material at my command. I wish here to express to Mr. Banks my very grateful thanks for a very illuminating discussion which I had with him, in which he clearly set forth the main characters of the various genera of the Northern Hemisphere, and pointed out what he considered the basic errors of accepted classifications. As soon as I had succeeded in convincing him that the Eustheniidæ and Austroperlidæ, as defined in this paper, had no close relationship with the Pteronarcidæ proper, the rest became "plain sailing," and we soon arrived at a complete scheme of classification which illustrates the phylogeny of the Order well, and at the same time offers excellent characters for the systematist.

The first point to be noted is that the old line of evolution which began with the Eustheniidæ and Austroperlidæ, is carried on by the Nemouridæ and Capniidæ. Both these families retain the original form of mandibles, clypeus and frons, while they also keep the primitive widely separated front coxæ. As regards their wing venation, both can be developed by further specialization from types found within the Leptoperlidæ; but the Capniidæ have progressed a point further than the Nemouridæ, in having lost the fork of 3A in the forewing. On the other hand, the Capniidæ have retained the original many-jointed cerci; while, in the Nemouridæ, these processes are reduced, both in larva and imago, to a single joint. Mr. Banks and I quite agreed that the elevation of the groups of *Taeniopteryx*, *Nemoura* and *Leuctra* to full family rank was not justified; and, in this paper, these groups are considered to be only subfamilies of the Nemouridæ.

The second point to note is that the two families Pteronarcidæ and Perlidæ (this latter including the Perlodidæ, which are at most only a subfamily of the Perlidæ) form an evolutionary sideline marked by certain high specializations

coupled with a primitive venational scheme, viz., reduction of the mandibles to a weak lamina, (in the case of *Perlidae* followed by an inturning of the clypeus and labrum under the frontal shelf, so that neither of these parts is visible from above), and, in the larva, either absence of gills or replacement of the original segmental gill-appendages of the abdomen by secondary gill-tufts around the bases of the legs and on the first two abdominal segments. Within this complex, the *Pteronarcidae* keep the more primitive form of venation, very similar to that of the *Austroperlidae*; like these latter, they have lost both the archdictyon of the anal fan and also the original complete contour of the outer margin of the hindwing. They are also specialized in a unique manner by the approximation of the fore coxæ. On the other hand, the *Perlidae* have a somewhat more advanced venational scheme, though some of the original cross-venation still persists in the *Perlodinae*; the fore coxæ remain widely separated, but the joints of the tarsi become specialized, both first and second joints being very short, and the third much longer than both these two together. The *Perlodinae* differ only from the *Perlinae* in the more complete cross-venation of the distal portion of the wing, and therefore cannot be granted at the most more than subfamily rank.

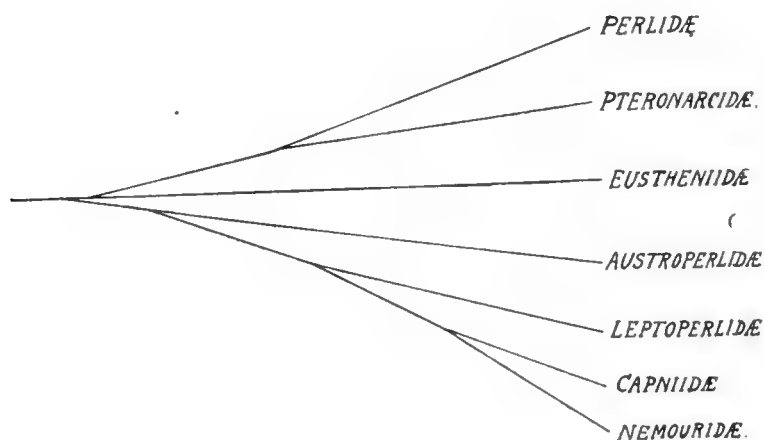


Fig. 2.—Phylogenetic diagram to show the relationships of the various families of the Order Perlaria. The Eustheniidae are the remains of the original stock, without any specialized characters. The main line of evolution leads first to the Austroperlidae, from them to the Leptoperlidae, and culminates in the Capniidae and Nemouridae. From far back along the Eustheniid line, an evolutionary sidebranch gave origin to another distinct group, out of which arose the Pteronarcidae and the Perlidae.

The differences of the various families may be clearly set out in the following table, in which characters marked A are to be regarded as archaic, those marked B as specialized, while the addition of the letter U to either indicates that it is unique for the family. In the last line, the percentage of archaic characters present for the most archaic members of each family is calculated, the number so obtained giving a fairly reliable indication of the position of the family in the line of evolution. It should always be borne in mind that there are two culminating points for the family, viz., the Perlidae on the one hand, as the end of a side-branch of evolutionary effort, and the Nemouridae on the other, as the end of the main line of ascent of the Order. This idea is indicated in the Phylogenetic Diagram given in Text Fig. 2.

TABLE SHOWING PRINCIPAL CHARACTERS FOR THE FAMILIES OF THE ORDER PERLARIA.

Character	Family						
	<i>Eustheni- idæ</i>	<i>Austro- perlidæ</i>	<i>Pteron- arcidæ</i>	<i>Perl- idæ</i>	<i>Lepto- perlidæ</i>	<i>Capni- idæ</i>	<i>Nemour- idæ</i>
(1) Mandibles:—A normal; B, reduced to lamina....	A	A	B	B	A	A	A
(2) Clypeus and Labrum:—A, normal; B, hidden....	A	A	A	BU	A	A	A
(3) Palpi:—A, with short joints; B, one or more joints elongated.....	A	A	A	B*	A	B*	B*
(4) Anterior coxæ:—A, wide apart; B, approximated.	A	A	BU	A	A	A	A
(5) Tarsal joints:—A, 2 least, 3 longer than 1; B, otherwise.....	A	A	A	B†	A	B†	B†
(6) Cerci:—A, with 5 or more joints; B, reduced to a single joint.....	A	A	A	A	A	A	BU
(7) Outer margin of hindwing:—A, complete convex whole; B, with re-entrant angle at distal end of Cu ₂	AU	B	B	B	B	B	B
(8) Anal fan:—A, with cross-veins; B without..	AU	B	B	B	B	B	B
(9) Cross-veins in distal half of forewing:—A, present; B, absent.....	A	A	A	A(B)	A	B	B
(10) Cubito-anal cross-veins in forewing:—A, present; B, absent.....	AU	B	B	B	B	B	B
(11) Branches of Rs in forewing:—A, 3 or more; B, 2 or 1.....	A	A	A	A(B)	B	B	B
(12) Branches of Cu ₁ in forewing:—A, 3 or more; B, 2 or 1.....	A(B)	A(B)	A	A(B)	B	B	B
(13) Anastomosis or transverse cord:—A, absent; B, present.....	A	A	A	A(B)	A	B	B
(14) 1A in forewing:—A, present; B, absent.....	A	A	A(B)	B	B	B	B
(15) 3A in forewing:—A, forked; B, simple.....	A(B)	A	A	A(B)	A(B)	B	A
(16) Primitive paired lateral gills on abdomen:—A, present on segs. 1–5 or 1–6; B, absent.....	AU	B	B‡	B‡	B‡	B	B‡
Percentage of archaic characters§ for the most archaic members of each family....	100	75	63	44	56	25	25

*In Perlidæ not as elongated as in Capniidæ and Nemouridæ.

†In Perlidæ, 1 and 2 very short, 3 greatly elongated; in Capniidæ and Nemouridæ, either 1 or 2 elongated.

‡In Leptoperlidæ secondary gills are developed as an anal rosette; in some Pteronarcidæ, Perlidæ and Nemouridæ, secondary gill-tufts are developed in various positions on the thorax or base of abdomen.

§In the table, I have not included the character of the presence or absence of fusion of M₃₊₄ with Cu₁, or Cu_{1a}, in hindwing, as I have been unable to study the tracheation of larval wings in all families. It should be noted that this fusion is absent in Eustheniidæ, but present in both Austroperlidæ and Leptoperlidæ.

KEY TO THE FAMILIES OF THE ORDER PERLARIA.

- (1) { Anal fan of hindwing well formed, and with a complete archdictyon or original meshwork of cross-veins; the contour of the outer margin of the hindwing a single convex whole, without any re-entrant angle at the end of Cu₂.....*Eustheniidae*, n. fam. (Text Fig. 1).
 Anal fan of the hindwing without any archdictyon; outer margin of hindwing with a marked re-entrant angle at end of Cu₂.....2.
- (2) { Anterior coxæ closely approximated; cross-venation retained except on anal fan; mandibles reduced to a weak lamina.....*Pteronarcidae*.
 Anterior coxæ remain widely separated.....3.
- (3) { Mandibles reduced to a weak lamina; clypeus and labrum become hidden beneath frontal shelf; last joint of tarsi much longer than 1 + 2....*Perlidae*.
 Mandibles, clypeus and labrum remain normal; last joint of tarsi not longer than 1 + 2.....4.
- (4) { In forewing, three anal veins are present, 1A running very close to Cu₂.....*Austroperlidae*, n. fam. (Text Fig. 3).
 In forewing, 1A is eliminated, leaving only 2A and 3A, the latter forked or simple.....5.
- (5) { In both wings, no true anastomosis connects the main veins from R to Cu₁ near middle of wing; cross-veins are always present in the distal portion of the wings.....*Leptoperlidae*, n. fam. (Text Fig. 4).
 A true anastomosis or transverse cord is always present, connecting the main veins of both wings from R to Cu₁; cross-veins not usually present distad from the anastomosis.....6.
- (6) { (In forewing, 3A is forked; cerci are vestigial, being reduced to a single joint.....*Nemouridae*.
 In forewing, 3A is simple; cerci remain long and many-jointed.....*Capniidae*

FAMILY AUSTROPERLIDÆ.

Tasmanoperla, n. g.

(Text Fig. 3).

Allied to *Austroperla* Needham, from which it differs only in the following points:—

Veins of the forewing very strongly marked, cross-venation very prominent, (*Austroperla* has the cross-venation weak, especially in the distal half of the wing, where the cross-veins are not easy to see in most specimens). In the forewing, 1A diverges from Cu₂ slightly, then converges towards it distally; (in *Austroperla* 1A lies very close to Cu₂ throughout, and is a much more weakly formed vein). Forewing considerably narrowed at the base, without any clearly marked anal angle; (in *Austroperla*, the forewing has a definite anal angle, distad from which the posterior margin runs almost parallel with the costal margin of the wing).

Genotype.—*Eusthenia diversipes*, n. sp. (Tasmania).

Tasmanoperla diversipes, n. sp.

(Text Fig. 3).

No description of this species appears ever to have been published, although the name is mentioned in literature by Walker and others. It would seem probable that Westwood had made a MS description, from which the name was taken and used in print, without any corresponding description. The species is closely allied to *Eusthenia thalia* Newm., 1839, from which it may be distinguished as follows:—

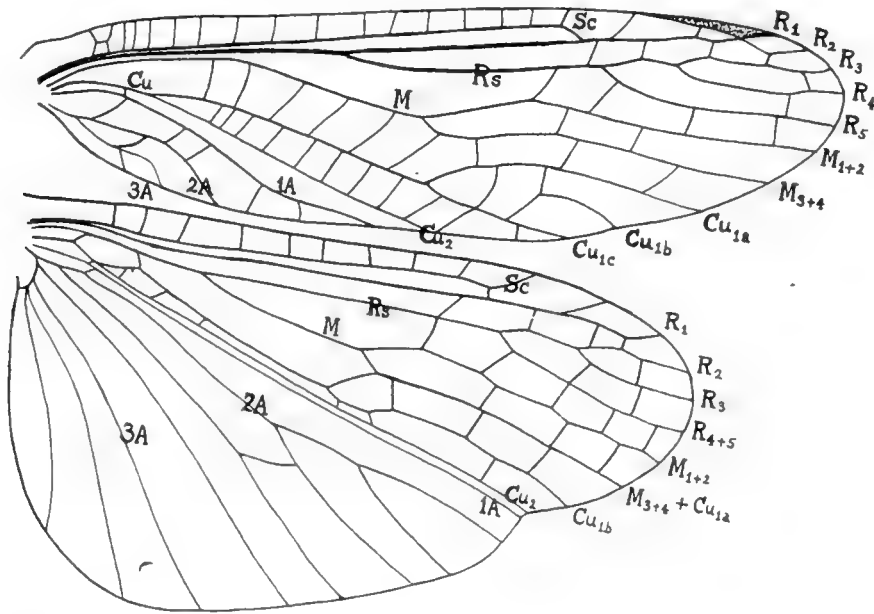


Fig. 3.—Venation of *Tasmanoperla diversipes* n. g. et. sp.; family Austroperlidae.

Wing-veins brown, the costal veinlets of the forewing, and the distal ends of the main veins of both wings around the apices marked with small dark patches. Forewings very irregularly irrorated with brown, but a clear, unshaded patch of irregular shape is left at one-third from apex. (*E. thalia* Newm. has the forewing of a dark smoky colour, with a very clear and more regular, somewhat cream-coloured patch left unshaded in about the same position). Legs black, with rich brown marks at the bases of the femora and tibiae; the brown on the hind femora occupies the basal half.

As in *E. thalia*, the wings are slightly shorter than the abdomen, the cerci rather short, the antennae shorter than the forewing, and the prothorax absolutely square in shape.

Type.—Holotype female, in Coll. Tillyard.

Locality.—Mount Wellington, Tasmania, Jan. 31st, 1917.

This species is made the type of the genus *Tasmanoperla* as it is the one which I have studied and figured. I have, however, seen specimens of *E. thalia* Newm., and there can be no doubt that it also must be placed in this genus.

FAMILY LEPTOPERLIDÆ.

Note on the Type Specimen of *Leptoperla Beroe* Newm.

(Text Fig. 4a).

The venational characters of *Leptoperla beroë* Newm., which is not only the type of the genus, but also the first Leptoperlid ever described, were not clearly given by Newman. The type is in the Hope Museum, Oxford. By the kindness of Professor Poulton, F. R. S., I was recently able to study this specimen carefully. Text Fig. 4 shows the venation of the right forewing, which has a peculiar aberrancy in that the two branches of M come together and fuse for a short space, and then separate again distally. The left forewing and both hindwings are much rolled and crumpled, the specimen being gummed on card. By softening these wings with warm water, and uncurling them with a fine brush, I was enabled to prove that the left forewing possesses a normal venation, with both branches of M running free and parallel to their tips. The following diagnosis for the genus may now be given:—

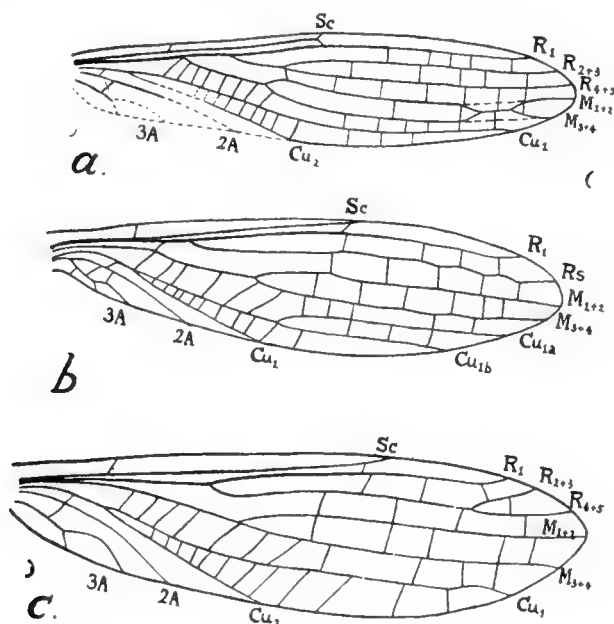


Fig. 4.—A. Right forewing of type specimen of *Leptoperla beroe* Newm. The normal courses of the branches of M, and the form of the crumpled anal area, as revealed by a study of the damaged left wing, are shown by dotted lines.
 B. Right forewing of a specimen of *Dinotoperla opposita* (Walk.) from Mount Wellington, Hobart, Tasmania.
 C. Right forewing of *Zelandobius confusus* (Harc) paratype, from Wellington, New Zealand.

Antennæ and *cerci* long, the latter considerably longer than the abdomen. *Forewing* with Sc stopping just short of half-way, its tip forked. Rs and M both forked not far from their origins, Cu₁ unforked and very long, running to the same level below the apex of the wing as that at which R₁ ends up above it. Complete sets of cross-veins between M and Cu₁ and also between Cu₁ and Cu₂. 2A simple, 3A forked. Irregular cross-veins enclosed in pale, oval spaces occupy positions in the distal half of the wing; (the wing membrane generally is of a brownish colour). *Hindwing* with Sc as in forewing; Rs simple; M with a free upper branch, and with its lower branch fused with Cu₁ to the border; Cu₁ simple; anal fan with five straight veins excluding 1A. (Cross-veins present

in hindwing are the humeral, an oblique one connecting R_1 with R_s towards half-way, and two connecting Cu_2 with the fused vein above it in its distal half).

The locality for this species is Tasmania. Though I have collected carefully in many places throughout the island, I have never met with it. The common Leptopterlids of Australia, Tasmania and New Zealand do not belong to this genus.

Dinotoperla, n. g.

(Text Fig. 4b).

Cerci shorter than the abdomen. Third joint of tarsus slightly longer than basal joint. Forewings with R_s simple, Cu_1 deeply forked, and complete sets of cross-veins between M and Cu_1 , and also between Cu_1 and Cu_2 . Hindwing with only slight fusion between M_{3+4} and Cu_1 , and with the anal fan narrower than the rest of the wing at the end of Cu_2 .

Genotype.—*Leptoperla opposita* Walker, Tasmania.

This genus differs radically from *Leptoperla* Newm. in its much shorter cerci, its longer distal joint of the tarsi, in the loss of the fork of R_s and in the retention of the fork Cu_1 . It is closely related to *Griopteryx* End. and *Paragriopteryx* End., from South America (these two genera are barely distinct), but can be at once separated from them by the unforked R_s of the forewing and by the possession of the complete series of cross-veins between M and Cu_1 .

A number of undescribed species of this genus occur in Australia and Tasmania.

Zelandobius, n. g.

(Text Fig. 4c).

Allied to *Griopteryx* End. and *Paragriopteryx* End. from South America, but distinguished at once from them by possessing a simple Cu_1 in forewing and a wide anal fan in the hindwing, as well as by the retention of the complete series of cross-veins between M and Cu_1 in forewing. R_s is distally forked as in *Griopteryx* and *Paragriopteryx*.

Genotype.—*Leptoperla confusa* Hare, New Zealand.

Leptoperla hudsoni Hare also goes into this genus, but *L. fulvescens* Hare and *L. maculata* Hare belong to *Aucklandobius* End. All these species are from New Zealand.

Zelandobius differs from *Aucklandobius* in having R_s distally forked in the forewing, and the fusion of M_{3+4} with Cu_1 not complete in hindwing. *Aucklandobius* differs from *Antarctoperla* End. chiefly in its much wider anal fan and in the complete fusion of M_{3+4} with Cu_1 in hindwing.

Both *Zelandobius* and *Aucklandobius* are represented in New Zealand by a number of undescribed species. The *Leptopterlidae* of South America are evidently closely allied to those of New Zealand and Australia, and a knowledge of all the forms is necessary for the study of those in any one region.

EXPLANATION OF TEXT FIGURES.

1A, 2A, 3A, first, second and third anal veins, respectively; Cu_1 , first cubitus, with its branches Cu_{1a} , Cu_{1b} , Cu_{1c} , Cu_{1d} ; Cu_2 , second cubitus; M_{1+2} , M_{3+4} , the two branches of the media; R_1 , radius; R_s , radial sector, with its branches R_2 , R_3 , R_4 , R_5 ; Sc, subcosta.

A NEW SPECIES OF COPTODISCA. (LEPID.)

BY WM. G. DIETZ,
Hazleton, Pa.

Coptodisca kalmiella, n. sp.

Size minute. Head, palpi and antennæ silvery gray, the latter long. Forewings golden-brown from the base to about the middle of their length, passing gradually into golden yellow; a silvery, triangular band-like spot at about two-thirds the wing length, on both the costal and posterior margins, the apices of which nearly meet on the disk, and margined proximally and distally with black. Cilia nearly double the width of the wing, traversed by the bases of the black-margined silvery spots, a black costal stria before the apex; a trapezoidal black spot in basal two-thirds of the cilia, at the apex, surmounted by a black line extending to the edge of the cilia; basal two-thirds of dorsal cilia in apical third with two broad, concentric lines separated by a pale line of the ground colour; proximad to this is a brownish tuft, from base to free margin of cilia; rest of cilia, a brownish gray. Hind wings very narrow; cilia about three times their width. Legs and body, silvery gray.

Habitat.—Browns Mills, N. J., mining leaves of *Kalmia angustifolia*. Collectors, H. B. Weiss and C. S. Beckwith, June 22 to June 30. Type and paratypes in collection of H. B. Weiss.

NOTES ON COPTODISCA KALMIELLA DIETZ, A LEAF MINER OF KALMIA ANGUSTIFOLIA.

BY HARRY B. WEISS AND CHARLES S. BECKWITH,
New Brunswick, N. J.

This microlepidopteron first attracted our attention at Brown's Mills, N. J., by its work on the leaves of sheep laurel (*Kalmia angustifolia* L.) which were observed to be full of small oval holes. Closer observation revealed mines inhabited by lepidopterous larvæ and upon rearing them, we secured a species of *Coptodisca* which was kindly described by Dr. W. G. Dietz as *kalmiella*.

The mines of this species are irregular and blotch-like, extending from the midrib almost and sometimes entirely to the edge of the narrow leaf. They are visible on both sides of a leaf, more so on the upper where they appear as reddish brown, dry areas partly filled with excrement. The number of mines in a leaf varied from one to twelve. Twenty-nine leaves were found to average five mines to a leaf. In some leaves many of the mines ran together and took up most of the leaf surface. Leaves on all parts of the plants were infested, especially terminal ones.

During the last week of May many mines were found to contain full-grown larvæ, and many were empty. From this it appears as if the larvæ over-wintered in the mines and that our observations started just as the larvæ were leaving. When full grown the larva cuts an oval case (3 mm. long; 1.6 mm. wide) from a part of the mine which is free from excrement, this case consisting of the semi-transparent upper and lower leaf surfaces which are fastened together. This oval case is regular in outline with a clean cut edge. When the oval is completely cut, the case containing the larva either drops to the ground or the larva crawls to the tip of a leaf pulling the case after it, and finally drops

to the ground after hanging a short time suspended by a thread. Once on the ground the larva crawls under fallen leaves, etc., and pupates within the case, this stage requiring from two to three weeks, the moths appearing about June 20 and being plentiful a week later around sheep laurel in the field. In order to facilitate the emergence of the moth, the pupal case projects slightly from the oval case. It is not known how many broods occur in New Jersey. Probably the over-wintering larvæ are those which hatch from eggs deposited during July.

Kalmia angustifolia L., is frequent in sandy ground, especially around the edges of bogs in the pine barrens and often covers large areas. In view of this, the miner should be found in many other localities in the pine barrens. Dr. Dietz writes that he has bred this species in numbers from sheep laurel collected in Pennsylvania and has noted as many as twelve to fourteen mines in a single leaf.

Full-grown Larva.—Length 3.4 mm. Width 0.5 mm. Head and first two segments brownish, remainder of body white with greenish tinge, somewhat translucent; elongate, tapering slightly posteriorly; body notched at sides, flattened dorso-ventrally; head small, mouth-parts dark, first thoracic segment longest, second and third thoracic segments subequal in length; abdominal segments subequal in length except in the ultimate and penultimate which combined approximate the length of the preceding segment; first thoracic segment not quite as wide as the second and third which are subequal in width; abdominal segments subequal in width except the last three or four which are narrower; prothorax bears a dorsal, dark spot which covers most of the surface; dorsum of meso- and metathorax bears a somewhat similar dark area each with separated, subcircular light areas. First seven abdominal segments bear irregular, oval, ill-defined dark areas; dorsal markings of eighth abdominal segment somewhat similar to those on dorsal surface of metathorax, the subcircular light areas may be fused or only slightly separated; dorsal surfaces of remaining abdominal segments may bear indications of dark areas or be entirely light; ventral surface and markings similar to those of dorsal surface except that the dark areas on the third, fourth, fifth and sixth abdominal segments are replaced by dark, oval rings; head and sides of each thoracic segment bear several fine hairs; a single hair on side of each abdominal segment; dark areas appear to be finely shagreened; shagreening on prothorax more pronounced.

Another lepidopterous miner of sheep laurel was described by Dr. Dietz in 1907 (Tr. Am. Ent. Soc. XXXIII, p. 291). This is *Ornix kalmiella*, the larva of which makes a pale, orange-coloured, blotch-like mine in the upper side of a leaf. The localities for this species as given by Dr. Dietz are Pa. and Conn., larvæ, August and September; adults, following May.

CHANGE OF ADDRESS.

As from 1st January, 1921, the permanent address of the Publication Office of the Imperial Bureau of Entomology will be 41 Queen's Gate, London, S.W., 7. All communications respecting subscriptions to or exchanges for the Review of Applied Entomology and Bulletin of Entomological Research or to the Bureau Library, should be sent to the Assistant Director at above address.

PSEUDOMACROMIA NATALENSIS AND MERUENSIS (ODONATA).

BY S. G. RICH,
Durban, Natal, South Africa.

The present paper arises from the peculiarities of a specimen of *Pseudomacromia* collected by me at Edendale, Natal, on Nov. 12, 1918, and now in my collection. The specimen is a female, measuring abdomen including appendages 40 mm., hind wing 43 mm., fore wing 43 mm., both pterostigmas 3 mm.

The specimen has the following features of interest. Lower lip yellow brown on side lobes, with centre lobe black and a black rim on the mesal edge of each side lobe. Upper lip bordered with very dark brown. Across frons immediately above lip, a dull greenish band about 1 mm. wide. Top of frons steel blue. Vertex brown, with traces of steel blue. Both wings flavescent from beneath stigma mesally, the fore wing until one cell from nodus, the hind wing half way to nodus; this is a vague cloudy flavescence except at the costal border of the fore wing. There is a very faint flavescence extending to the first cross-vein under the subcosta and the cubitus of the fore wing, and a stronger flavescence in the same place and four cells closest to the membranule in the hind wings. The abdomen has the first two segments yellow-brown with a thin, black band, marking the end of segment 2; segment 3 has a thin-lined yellowish cross on the back, on an otherwise dark ground; the other segments are dark brown with narrow, dull yellow markings along the sides. The membranule of the wings is grayish, becoming cream-coloured at its costal end.

Barring the head details and the basal flavescence of the fore wing, the specimen agrees with Martin's original description of *P. natalensis* female (Bull. du Museum d'Histoire Naturelle, 1900, p. 106).

In the Selys Catalogue, Fasc. XIV, p. 805, there is given in brackets the species *P. meruensis*, from Kilmandjaro, East Africa. This, described as *Homothemis meruensis* by Sjostedt, 1909, was not in the Selys collection, but Dr. Ris quotes the original description and assigns it to the genus *Pseudomacromia*. The present specimen agrees equally with this description, more especially as to the lips, frons, colouring of legs, and wing-flavescence. The dimensions are as in this description.

In view of the fact that the description of *P. meruensis* is based upon a single specimen, and that no others of this species are recorded in the Selys catalogue, I am strongly of the opinion that the two species are identical. *P. natalensis* is recorded from as far north as Macequece, Portuguese East Africa, in the Selys catalogue, and it is not unreasonable to expect that it would be found in the highlands of East Africa nearer the equator.

Martin's original description of *P. natalensis* is, except for the lips, and the cross-mark upon the back of the abdomen, identical with Sjostedt's of *P. meruensis*. The synonymy of these two species may be taken as highly probable, if not established.

It may be of additional value in this connection to mention the characteristics of a specimen of *P. natalensis*, in the collection of the Durban Museum, Natal. The specimen is a female, taken at Umbilo, one of the suburbs of Durban. It agrees with my specimen in possessing all the features which would show the identity of *P. natalensis* and *P. meruensis*. The flavescence

on the wing is somewhat fainter than in mine, but in the fore wing extends from the stigma to the nodus, and in the hind wing covers some seven cells close to the stigma only. The basal flavescence is as in mine. The dull green band across the frons is more prominent.

The two specimens have femora that answer to the description of either species: the first and second femora light brown, the third darker, but light brown at the base.

In both specimens the claws are not alike throughout. In each case approximately half of the claws have the lateral spur of the same length and breadth as the tip of the claw proper, and the remainder have the spur slightly thicker. *P. meruensis* is described as having the spur similar to the tip; *P. natalensis* (in the Selys catalogue) as having the spurs thicker.

The pterostigmas of the museum specimen are all 2.3 mm. long; in mine they are .5 mm. longer.

There is every evidence that the two are of the same species; yet the museum specimen is clearly *P. natalensis* and mine may be *P. meruensis* equally as well, according to description. The identity of the two species, as stated above, appears highly probable, if not fully proven.

A NEW RACE OF *STRYMON MELINUS* HBN.

BY J. MCDUNNOUGH, PH.D.*

Entomological Branch, Ottawa.

***Strymon melinus atrofasciata*, var. nov.**

♀.—Upper side rather deep slaty-gray with maculation similar to that of the Eastern race (*humuli* Harr.). Beneath even slaty-gray with no tinge of brown, the post-median row of spots heavy, black, especially prominent on secondaries; these spots are bordered outwardly with white but show practically no traces of orange colour on their inner margin. The subterminal maculation is the same as in the type form with the orange spots very bright in colour.

♂'. Similar to ♀, but slightly darker on upper side with ground colour on both sides showing a faint brownish ringe.

Holotype.—1 ♀, Wellington, B. C., (July 12th, 1904), (G. W. Taylor), in Canadian National Collection.

Allotype.—1 ♂, Duncan, B. C., (C. Livingston), in same collection.

Paratypes.—2 ♀'s, Royal Oak, B. C., (May 26th, 1917), (R. C. Treherne); Victoria, B. C., (May 21st, 1917), (A. E. Cameron), in Canadian National Collection.

The above race, characterized by its dark ground colour and heavy black spotting on under side with lack of orange margin to spots, seems confined to Vancouver Island. It bears apparently a certain relation to *pudica* Hy. Edw. in this lack of orange, but this latter race is described as having the lower side "more silvery grey" than *melinus* with obsolescent maculations whereas the heavy black maculation of the underside in the present race is a feature that at once strikes the eye.

*Contribution from the Entomological Br., Dept. of Agr., Ottawa.

THE LARVA AND BREEDING PLACE OF *Aedes aldrichi* DYAR AND KNAB. (CULICIDÆ, DIPTERA).

BY ERIC HEARLE,

Dominion Entomological Laboratory, Mission City, B. C.

Aedes aldrichi is the dominant mosquito in the Lower Fraser Valley, B. C., and the main cause of the serious mosquito pest that at times occurs in that district and casts an evil shadow over the most beautiful period of the year. Previous to the summer of 1920, the larva had been unknown and there were no definite data as to its breeding place. Extensive larval collections have shown the main breeding places to be in the wooded river bottoms. These areas are thickly covered with cottonwood and a tangled low growth of willow, rose and spiraea. They are locally known as alder-bottoms. At freshet time flooding converts them into temporary swamps capable of producing enormous numbers of mosquitoes. *Aedes vexans* and *Aedes cinereus* occur with *Aedes aldrichi* in these alder-bottom areas, but the latter is the chief species.

Description of Larva of *Aedes aldrichi*.

Stage IV.—A stout dark grey larva, very much like that of *Aedes hirsuteron* and *Aedes aestivalis*, from which it differs mainly in the dorsal head hairs and, in the case of *hirsuteron*, in the laterals of the sixth abdominal segment.*

Head with a dark patch on the vertex; broad, narrowed before the eyes; front roundly arcuate. Antennæ, inserted at notch in head, yellowish, moderate, curved, swollen at base, fairly thickly covered with large and small spines; antennal tuft of about seven hairs of moderate length placed a little before centre; at the apex are four short spines, one long spine and one short bud-like process. Eyes transverse and pointed. Upper pair of dorsal head hairs usually in twos and lower head hairs single; ante-antennal tuft of about seven hairs. Mental plate broadly triangular with a small, central tooth and fourteen to seventeen teeth on each side, those toward base largest. Thorax rounded, wider than long, hairs abundant and fairly long. Abdomen stout, anterior segments shorter and broader, hairs sparse, laterals moderately long, secondaries short; laterals usually double from second to sixth segment, but often in threes on third segment; first segment with two pairs of fairly long hairs. Air tube stout, about three times as long as wide; pecten of about seventeen evenly spaced teeth reaching to middle; teeth gradually larger distally; individual tooth a long spine with broad base, a stout spine at base and a very small tooth between this and the main spine; a tuft of six hairs following the pecten. Lateral comb of eighth segment of about twenty-five scales in a broad triangular patch; scales three deep; individual scales broadly elliptical, fringed with short delicate spines from centre outwardly, a longish stout spine at apex. Dorsal plate reaching nearly to ventral line. Dorsal tuft a brush of about eight hairs and one long hair on each side. Ventral brush well developed. Anal gills ensiform and about twice as long as eighth segment. Skin of larva covered with minute spicules.

*Note.—A great deal of variation occurs and a good series is needed to ensure accurate determinations. The dorsal head hairs are not very constant. In many cases the upper dorsal head hairs are in threes and the lower head hairs in twos, sometimes they occur in fours and in threes, but in only a very few specimens examined were the upper head hairs found to be single as in *aestivalis*. In many specimens some of the abdominal laterals were found to be in threes, but the sixth laterals are always paired, unlike those of *hirsuteron*, in which they are single.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE-HISTORY OF A HOBBY HORSE.

BY FRANCIS J. A. MORRIS,

Peterborough, Ont.

PART II.—BOY AND MAN—SAPLING GROWTH.

(Continued from page 28, Vol. LIII.)

Long before Slyboots went abroad, a new element had begun to enter into our lives which made itself specially felt in our dealings with Nature—the joy of memory and past associations. This seemed to grow quite independently of the rapid waning of novelty from our environment and out of all proportion. I can remember how my brother and I both lamented that while going back to Scotland seemed to give us unspeakable thrills of pleasure, no such inspiration came from trips in England. It puzzled us both at the time, but I have no doubt now that it was due to the countless happy memories awakened in us by the sights and sounds of childhood's home; just as soon as we crossed the Tweed at Carlisle, and heard the names of the stations shouted in good broad Doric. My brother never stayed in England long enough for these stored-up treasures of the senses to be converted into memories, but I am happy to think and to bear testimony to what I suppose is a universal human experience, that I can call these sweets of life to-day not only from our native heath of Scotland, but from many an English lane, aye! and from half a hundred sunny scenes of old Ontario.

This fondness for revelling in memory, it seems to me, grew very fast after Slyboots went abroad, till it became a passion for the old familiar things. It was then almost certainly for that reason that the charm of recurring seasons first laid hold upon me and a hungry craving for the Spring. It had always been living things that drew me, or things that once had lived (like fossils of the chalk) and now bore mute witness through the ages to the far-off day of their pride; and I came to yearn for signs of life's renewal on the earth. Autumn and winter were the dead seasons, but how eagerly I watched for the rather primrose and the springing violet! with what exultation I caught the earliest call of the cuckoo and the first skimming flight of the migrant swallow! The coming of Spring made the heart gush as though it too had been for months fast held in winter's icy clasp.

I was much given to long, solitary walks. To wander land and meadow, woodland and moor, mountain and glen, was an exquisite pleasure that thrilled the very soul; all day long, no doubt, on these tramps, I was drinking in countless sights and sounds, landscape mellowed in the distance, soft hues of foliage, a hundred flowers and ferns and birds, the murmur of pines and running water, the cooing of the stock-dove and the song of the Skylark; but I was rarely con-

scious, except in the first days of early Spring, of the individual notes of colour and music and fragrance that blended in these hours of happy reverie.

Wherever I went, seemingly, I must first make myself acquainted with any new feature of living Nature that came within my ken, be it insect, bird, or flower, before I could give myself over to the contemplation and enjoyment of earth. But once the new had become the familiar, I was satisfied, and fell back on the old pleasures of memory and association. Thus the first two years of my residence at Oxford kept me busy with the surface fossils of the stone-brash; repeated visits must be made to Iffley to see the wonderful fritillaries in bloom, trips taken up the Cherwell at the season of the cowslip, and whole days spent haunting the edge of Wytham Wood for the enthralling song of the nightingale; the same with first days in Buckingham and Worcestershire, in Somerset and Devon. New discoveries brought keen pleasure and delight, but these were as nothing to the ecstasy of revisiting; when the novelties had been caught up in a network of associations, and their beauty enhanced a thousandfold by the host of memories they awakened, all bathed in a subtle atmosphere of emotion. And perhaps of greater value still for the mind in its maturing, were the hours of conscious meditation and reflection on Nature and life, for which all this raw material of observation was, I must believe, an instinctive preparation.

There comes to most of us in the exuberance of youth, a day when we are impatient of all tradition, and even feel guilty of a certain dishonesty in the placid acceptance of current opinion. I was about sixteen when the eternal riddle of existence first propounded itself to me, and none of the conventional readings brought satisfaction or peace of mind. This was a year after my brother went abroad, the first summer holidays spent in Scotland without his companionship. Our host was always the same, an old army doctor whose acquaintance we had first made shortly before my father's death. He had lectured at Netley, seen service in India, and returned to his native Scotland on retirement. Bred up a staunch old Presbyterian, and by nature a rigid moralist and strict disciplinarian, he was yet a man of great tolerance, quite free from dogma, and generous in his sympathies; a great reader (though shy of fiction and poetry alike), open-minded and of liberal view, a scholar and a scientist, he was, as you may easily understand, a believer in evolution and an ardent disciple of Darwin.

I cannot enough admire our host's patient forbearance with his two school-boy guests and their sad lack of seriousness. On our first visit to him after settling in the south of England, a prolonged spell of bad weather (coupled in Slyboots' case with a touch of bronchitis) prevented us from going out very much, and we made almost daily raids on the village library for story books. My favorite author was Ballantyne, my brother's was Kingston, but neither of us had the remotest idea of how or why his favorite author made such a strong appeal to him. I fancy the doctor must have been aching to see us tackle something better worth while, but he never interfered and apparently even gleaned no small amusement from some of our frequent disputes; for I can still hear his guffaw over what I fondly imagined a shrewd stroke of mine at the close of a battle royal with Slyboots: "Well! if Slyboots would have it, the reason I liked Ballantyne best was because he gave you more for your money; there were whole chapters at the end of Kingston, and sometimes even in the

middle of the book, wasted over footling love affairs, when the hero might have had at least one more hair-raising adventure in the forests of Brazil, the Indian Jungle, the African veldt, or wherever it happened to be."

At sixteen I had outgrown these boys' books and was ripe for more substantial reading. It so happened, too, that in the previous term I had heard quite a lot about Darwin and the Theory of Evolution. It formed a subject of discussion among schoolmates on the Science side, who were actually divided into two rival camps under the leadership of this master and that, known to favour or to scout the doctrine; a special hero of my schoolboy worship, some years my senior and a prefect in the house where I spent my first few months of attendance at Dulwich College, had recently paid me a visit from Guy's Hospital in his first year as a medical student, and from him I learned some outlines of the theory; it had even been debated in my hearing at home by an elder brother in conversation with a business friend; and so it came about that the idea of Evolution figured quite prominently in the almost daily thoughts of a classical student of sixteen; and it was in answer to a question of mine that the good doctor first broached the subject and explained to his young guest as clearly and simply as might be the nature and trend of that world-revolutionizing treatise, Darwin's "Origin of Species."

And in a very few days, as it seemed, the solitary boy of sixteen with his time-old mystery of life, found sympathy and help as well as companionship in his host of nearly sixty. The doctor was very methodical and kept a series of logbooks or diaries in which he entered a summary of everything he read, even to magazine articles; these notebooks he called his "omnium gatherums." He had not a large library, as most of his reading was done by way of periodic parcels of books from Edinburgh, kept for two or three months and then exchanged. But he had a little bookcase of favorites, and after suggesting some volumes to be read in a certain order, he gave me the run of the shelves. I first read round the theory in three or four books like Robert Chambers' "Vestiges of Natural Creation," Lauder Brunton's "Bible and Science," and Samuel Laing's "Modern Science and Modern Thought;" I was then made to tackle, just as soon as I seemed ripe for it, Darwin's "Origin of Species" and "Descent of Man;" and after these came a troop of his great exponents, Huxley, Wallace, Romanes, Grant Allen, and Lubbock. When once I had assimilated some of this thought, I was promoted from the Doctor's exposition to the give-and-take boxing bouts of argument and discussion. Long before I passed from school to the university, I was as thorough-going a Darwinian as the old doctor himself and even more advanced, partly from the natural insolence of youth, and partly from wide reading in the noblest literature of all ages and lands, the fearless freedom of Greek poet and philosopher.

Together as men and equals we read and discussed Weismann and Haeckel, or shook our heads sadly over the unsoundness of Wallace's closing chapters on "Darwinism" with their "*deus ex machina*" of Spiritualism. When Huxley tilted with the clericals in the pages of the XIXth Century Magazine, we both keenly admired the skill with which he found the joints of the mediaeval armour and unhorsed his cumbrous opponents; a "bonny fechter," like Alan Breck, was that brilliant pamphleteer, and a tower of strength to the good cause, as we viewed it, of untrammelled thought—the march of Science. Unlike the

dear old doctor, my host, I had a great liking for fiction and was passionately fond of poetry; the great problem novels of the day, and indeed more recent books of mark I devoured with keen appetite, and was never tired of conning the pages of my favorite poets—Burns, Keats, Shelley, Rossetti, Swinburne and Matthew Arnold.

One great boon, I am sure, I owed to this course of systematic reading in Science. It added an intellectual interest to my long walks in solitary communion with Nature. For the habit of lonely wandering that I had formed on Slyboots' departure cannot have been entirely wholesome; there was hardly a sight or a sound in the world that did not awaken some chord of memory, and I often brooded over the past, though with more of wistful reverie than of sorrow in my mood. But as soon as the interest of this new theory took hold of me, it gave me a new outlook on Nature, and instead of brooding inwardly, my thoughts went out to Natural objects in search of illustration, to test book-theories as it were, and in this channel of activity they found a healthy and cheerful outlet.

More and more, it became a delight to mark the characteristic beauties of English scenery; the deep luxuriant lanes, the floral treasures of hedgerow and meadow, of riverbank and stream; the glories of the beech woods and groves of oak; the distant views of the breezy downs, and the wild grandeur of the Wessex moors. But always the crowning glory of the year, when Spring had blossomed into Summer, was the visit to Scotland. My favorite haunt, growing dearer season by season, was a mountain stream in the neighborhood of Bridge of Allan. Whether I took my fishing-rod or not made little difference, nor what direction I started out in; all paths seemed at last to lead to the mouth of the Wharrie burn where it merged in the river Allan, and then came an all-day tramp, up through the woods, past cataract and linn, climbing the steep glen by mossy rocks, past rowan and birch, out on to the open moor and then over the heather, till I had tracked the baby stream to its cradle in a mountain tarn, below the peaks of the everlasting hills.

As soon as I entered the University I began to gather a library for myself. One of the most treasured shelves was devoted to books of scientific theory; I made a selection of volumes from the International Scientific Series published by Kegan Paul, and became a subscriber to two new series—the Minerva Library of Famous Books, edited by G. T. Bettany, and the Contemporary Science Series published by Walter Scott; every volume of these two publications I purchased on issue and devoured at my leisure.

But my interest in Evolution never for a moment lessened the love of Natural objects or dulled the sense of mystery, of wonder, and of beauty in God's handiwork. And this emotional attitude to Nature was greatly strengthened in my student days at Oxford by a wonderful discovery that I made at the end of my second year. While travelling in the realms of gold I found that I was not alone or peculiar, had nothing to be ashamed of, in my solitary musing on the mystery of life. I found the most secret thoughts and feelings of my very soul from boyhood to manhood laid bare and given a language in two books that have been a bible to me ever since, the Poems of William Wordsworth, especially Tintern Abbey, and Richard Jefferies' Story of My Heart.

NEW BRITISH COLUMBIA TUSSOCK MOTH, HEMEROCAMPA
PSEUDOTSUGATA.

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For the past few years a species of tussock-moth has been reported as damaging the douglas fir in certain districts of British Columbia; it was determined by Mr. E. H. Blackmore in the Report of the British Columbia Provincial Museum, 1918, p. 12, as *Hemerocampa vetusta gulosa* Hy. Edw. and a figure of a rather rubbed ♂ was given on Plate 1.

An account of the extent of the devastation was also given by Mr. W. B. Anderson, in the Agricultural Gazette, 1919, VI, 139.

In the spring of 1920 I received a number of egg-masses of the species, collected by Mr. W. B. Anderson, the original discoverer, at Chase, B. C. From these I was enabled to breed a limited number of adult specimens; the young larvæ on hatching were offered hemlock and pine, douglas fir at the time not being available; a large number refused to eat and perished, but a few nibbled the blossom-buds of hemlock and fed on these until half-grown when they were transferred to douglas fir, a tree of this species having been located at the Experimental Farm. The moths emerged in the first week of July during my absence from Ottawa, an earlier date than that given by Mr. Blackmore in his account of the species, but probably due to more or less forcing of the young larvæ during the early spring.

From my present knowledge of the early stages and of the adults I cannot agree with Mr. Blackmore that the species is *gulosa* Hy. Edw. This species was described in Papilio I, 61, in a paper by Mr. Edwards dealing with the Pacific Coast species of *Orgyia* (*Hemerocampa*). In this paper *vetusta* Bdv., a species described very briefly from a ♂ specimen from California which is possibly still in the Oberthur Collection at Rennes, France, and which has certainly never been satisfactorily identified by American systematists, was limited to a lupine-feeding larva of the San Francisco Bay region, whilst the name *gulosa* was proposed for an oak-feeding larva which was found abundantly throughout the foot-hills of the northern Sierras. Both larvæ were described rather inaccurately and inadequately; roughly speaking, apart from the difference in food-plants, the main points of distinction are apparently to be found in the color of the dorsal abdominal tufts; in *vetusta* the tufts on abdominal segments I-IV are described as being whitish drab at base tipped with chestnut-brown; in *gulosa* tuft I is blackish, the other three tufts being white; the dorsal tuft on segment VIII is yellow tipped with black in *vetusta* and black in *gulosa*.

In Psyche VI, 438 (1893) Dr. H. G. Dyar gives a detailed description of the early stages of *gulosa*; his description of the 3rd and 4th larval stages corresponds well with Edwards' larval description; in full grown larvæ Dr. Dyar states of the tufts that they are "coloured a silvery-grey; in some specimens blackish or even black on the crests, but white on the sides, in others nearly all white." He further is of the opinion that Edwards confused the moths resulting from the two species of larva and that the description given by Edwards of the adult ♂ *vetusta* should apply to *gulosa* and vice-versa; to avoid confusion he limits the application of

*Contribution from the Entomological Branch, Department of Agriculture, Ottawa.

the names to the larval forms. We thus have a lupine-feeder (*vetusta*) with whitish tufts tipped with chestnut, producing a small ♂ with indistinct maculation of primaries and an oak feeder (*gulosa*) with white tufts occasionally black-tipped, emerging into a larger ♂ with distinct maculation. A similar arrangement was followed by Neumoegen & Dyar in their Preliminary Revision of N. Am. Bombyces (1894, Jour. N. Y. Ent. Soc. II, 28, 29;) later, however, in the List of N. Am. Lepidoptera (1902) Dr. Dyar treats *gulosa* as a variety of *vetusta*; the reason for this change is unknown to me but the arrangement was followed in the Barnes & McDunnough Check List (1917) for lack for any further data on the subject.

As neither the larva of *vetusta* nor of *gulosa* has been bred by me it is impossible to comment on the accuracy of the above statements; on the face of it, taking into consideration the larval distinctions and the difference in food-plants, I should incline to the belief that we are dealing with two distinct species; as to whether Hy. Edwards or Dr. Dyar is correct in the description of the resulting imagines remains for our California collectors to prove by careful breeding.

To return to our douglas fir-feeder I would point out that it cannot be referred to *gulosa* as the larva contradicts the description. In all the specimens reared (both ♂ and ♀) the dorsal tufts on abdominal segments I-IV were whitish, broadly tipped with chestnut-brown whilst the dorsal hair-pencil of segment VIII was black with a chestnut-brown tuft of half its length at the base anteriorly. The larva would thus correspond very closely with that of *vetusta*, according to the description, except that the hair-pencil of segment VIII could hardly be called "yellow tufted with black."

These discrepancies in the coloration of the larva and the fact that it is a coniferous feeder lead me to the belief that the species is undescribed; a parallel case is found in the closely allied genus *Olene* Hbn. where the pine-feeders are now recognized as distinct species from those feeding on deciduous trees.

***Hemerocampa pseudotsugata*, sp. nov.**

Ovum.—Laid in large clusters on the ♀ cocoon or adjacent areas, covered with a gelatinous substance to which are attached numerous dark, smoky hairs from ♀ abdomen; color white; hemispherical.

Larva, Stage I.—Resembles considerably a small *Porthetria dispar* in shape. Head large, brown, with sparse hairs; palpi and clypeus whitish. Body dirty gray, tinged with reddish laterally, tubercles represented by large chitinous patches (verrucae) containing long, slightly barbed hairs; the dorsal hairs are generally blackish, the lateral ones white. The usual Liparid wart laterally on the prothorax is very prominent with numerous long, black, hairs. Prothoracic plate large, rectangular, with two knob-like warts on the anterior edge, each bearing about 10-12 hairs arranged in a circle; several white hairs from the anterior margins of the segment overhang the head; posterior and ventrad to the plate are two minute setae closely approximated. Meso- and meta-thoracic segments with tubercles I and II narrowly separated; I small, obliquely oval with three short setae, II larger, roughly circular with about two hairs; in the lateral region are two further tubercles, very similar in size and equidistant.

On abdominal segments I-IV, VII and VIII verrucae I and II form together a large rectangle, I, narrowly separated from II, being triangular and forming the anterior dorsal corner of this rectangle; on segment II it bears five hairs, on

III three hairs and on the other segments two hairs; on abdominal segments V and VI it is reduced to a mere point with a single short, white, clubbed hair, noticeably distinct from the other setae.

Verruca II bears about ten hairs normally but on V and VI it is smaller with fewer hairs and in consequence more of the pale color of the integument is apparent; on these same segments it also bears 2-3 clubbed white hairs in close proximity to that of verruca I. Laterally a large, oblong verruca (tubercles III and IV) is present with the brown spiracle situated on its ventral edge; it bears numerous hairs, including a single long black one. Below it is a further smaller verruca clothed with short whitish hair and with one long white seta. Above the prolegs a small verruca with several short white hairs. Rear segment with four, large, equally spaced verrucae containing several long, backward-directed setae. Prolegs with two anterior and two posterior crotchets. Length on emergence 2 mm.

Stage II.—Head as before; body light gray with slight purple-brown dorsal sprinkling behind verrucae and heavy lateral sprinkling of same color; faint yellow shading on meso- and meta-thorax especially intersegmentally and also laterally along all segments below spiracle. Verrucae much as before but paler; from the large prothoracic wart arises a small tuft of short plumes as well as the bristles; verruca I on abdominal segments I and II with similar black plumed hairs and merely one or two bristles; verruca I and also II on segment VIII with a few black plumes on inner edge; otherwise the bristles from verrucae are long and mostly black; abdominal segment V with yellow dorsal shading and VI and VII dorsally with large circular yellow-orange eversible glands.

Stage III.—Head pale brownish. Body with grayish-white ground colour; dorsally the segments are shaded with dark brown forming a narrow dorsal line on thoracic segments and broadening out on abdominal to a band of dark color strongly broken with the pale ground colour and extending laterally to the lower edge of verruca II. Posterior portion of thoracic segments shaded with yellow-orange and the whole dorsum of abdominal segment V anterior to tubercles rather bright orange; glands on VI and VII bright coral-red. A broad broken band of dark brown laterally crossing verruca III, the verruca itself being encircled with pale ground color and with a patch of the same color behind it so that the edges alone of the dark band appear more or less continuous; a somewhat broken pale yellow subspiracular line below which the brown shading is predominant again. Verrucae rather pale except I and II on abdominal segments I-IV which are dark (blackish) and form a marked contrast to others which are slightly yellow tinged; short black pencils of feathered hair laterally from the large prothoracic wart; dorsal black hair pencils on abdominal segments I, II and VIII with very slight tufts of white plumed hairs on III and IV arising from verruca I. Of the barbed hairs the long ones are black, the others white, mostly all being longer than the hair pencils. Prolegs shaded basally and centrally with dark brown. Prothoracic plate tinged with yellowish. Not much increase in number of barbed hairs.

Stage IV.—Head black; clypeus and mouth parts whitish; overhung by white hairs arising from prothoracic plate. Body light gray tinged anteriorly with yellow; a dark, blackish dorsal stripe on meso- and meta-thorax broadening into a more or less solid band of black on abdominal segments with segment V

bright yellow-orange dorsally. Body shaded with black in supraspiracular area and with the orange-yellow subspiracular line of previous stages well marked. Lateral black hair-pencils from prothoracic warts; dorsal black pencil from abdominal segment VIII. Well developed tufts dorsally on abdominal segments I-IV, the anterior two light brown, often shading into deeper brown apically and frequently edged laterally with white plumed hairs; the two posterior tufts smaller, generally composed of white plumed hairs; tuft 3, however, often considerably tinged with light brown; in such cases tufts 1 and 2 are generally smoky brown; abdominal verrucae bright yellow-orange, edged at base by creamy line except verruca II of abdominal segments I-IV which is black. Long black hairs from verrucae few in number; numerous shorter hairs white. Eversible glands bright coral-red. Legs yellow-orange; venter pale yellow-gray.

Amount of dark suffusion on body variable, the ♀ caterpillar being lighter in colour than ♂.

Stage V.—Head black, with white clypeus; general ground color of body grayish caused by white suffusion on black ground with thoracic dorsal portion yellow with black centro-dorsal line; dorsum between tufts broadly black; on other abdominal segments narrowly black, in ♀ tinged with brown; dorsal tufts white at base, tipped broadly with light or dark chestnut-brown; black lateral anterior pencils as before; dorsal black pencil on abdominal segment VIII preceded by a brown recurved tuft half the length of the black pencil; a distinct subspiracular orange line; verrucae bright coral-red, shaded with black at base, ringed by whitish.

The ♀ larvæ were noticeably larger than the ♂'s but I was unable to discover that they underwent an extra moult as is generally the case in this group.

Imago ♂.—Colour dark chocolate-brown with none of the chestnut-brown shades of allied species except traces around the reniform. Considerable sprinkling of white scales rather evenly distributed over the whole wing, more especially noticeable in the apical and median areas. Usual lines well-defined and not perceptibly different in course from those of allied species; reniform more or less white-filled. Beyond the t. p. line on costa a prominent rectangular dark patch, surrounded by whitish scaling, giving rise to the irregular dark s. t. line which is more or less defined by white scaling and terminates in a small white patch above anal angle. In normally marked specimens this s. t. line is connected with the dark marginal line by a distinct dark dash through the interspace of veins 6 and 7. Secondaries dark chestnut-brown with a broad, darker brown marginal border of varying intensity. Expanse 27-30 mm.

♀. Wing-stumps and anterior half of abdomen smoky-gray, the posterior abdominal segments tufted with thick hairs of a blackish colour, much darker than the color found in allied species.

Holotype 1 ♂, Chase, B. C., bred at Ottawa, 1920, and in Canadian National Collection.

Allotype 1 ♀, Chase, B. C., bred at Ottawa, 1920, and in National Collection.

Paratypes 4 ♂'s, 2 ♀'s, from same locality in the National Collection and in the Barnes Collection, Decatur, Illinois.

The dark tufting in the ♀ and the dark ground colour of primaries of ♂ together with the dark subterminal dash in interspace 6 seem to be characteristic of the species.

NOTES ON COCCIDÆ VII. (HEMIPTERA).*

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A REVIEW OF MACGILLIVRAY'S "THE COCCIDÆ."

The impression seems quite generally to have prevailed (the present writer must confess to not having been immune to it) that the ability to recognize a few of our common orchard, shade tree and green-house scale insects entitles its possessor to recognition as a Coccidologist. It is, perhaps, in part this circumstance that has been responsible for the fact that while there have been many who have written on the Coccidæ there have been relatively few who have had any very profound knowledge of the group. The systematic literature, although impressive in quantity, has never been so in quality, in fact only too rarely has it risen above the level of hopeless mediocrity, while all too often it has descended even to the point of utter puerility. The greatest task before the present-day students of the Coccidæ (and those for some time to come) is that of overcoming this handicap.

In the face of these conditions it is obvious that the character of any treatment of the group that is based wholly or in large part upon the literature alone will be more or less definitely predetermined. At the best it can be of a very considerable, even if but temporary, usefulness by bringing the scattered literature to a focus and serving as a sort of point of departure. At the worst, if to the errors inherent in the sources from which it is drawn there be added an undue number for which the compiler is responsible, the possibility of usefulness may, to a very large extent, disappear. Not only may the task of which I have spoken above not be lightened, it may even to some extent be increased. This I consider, on the whole, to be the effect of MacGillivray's recent book, "The Coccidæ."

I do not need to be reminded that many of the criticisms of this book that I shall express are matters of opinion. Consequently, I may be pardoned for pointing out that as a basis for the opinions that I shall present I have available what is possibly the second largest collection of Coccidæ in the United States, and that I have personally examined with varying degrees of thoroughness some hundreds of species in the group. On the other hand, MacGillivray very clearly indicates in the preface of his book that it is based chiefly upon the literature alone, and it is obvious from the text that his acquaintance with the insects themselves is relatively limited. Even the air of profundity imparted by the special terminology employed and the appearance of authority with which the material is presented cannot entirely conceal this fact.

I cannot in any paper of reasonable length deal in great detail with the book. An extended analysis must wait upon revisional studies of the various groups, and I am presenting here a consideration only of the more obvious errors and of the conclusions in which I differ most widely from MacGillivray. It is, for instance, no part of my intention to consider the many typographical errors and other evidences of carelessness, such for example as the constant misspelling of *Antonina* (pages 122, 123, 145, 146, 476) and *ariditatis* (pages 182 and 476).

*Continued from Canadian Entomologist 52:65. (1920.)
March, 1921

The most objectionable feature of the book is the great number of new genera that have been proposed in the subfamily Diaspidinae, practically all of which are based upon species that in all probability the author has never seen. That many new genera are needed in this group is undeniable, yet before the wholesale naming of them is undertaken there should first be a careful review of the types of the existing genera, and the whole work should be based upon an examination of specimens. The naming of new genera upon the basis of printed descriptions alone is not likely even under the most favorable conditions to be especially helpful. When done under the conditions prevailing in the literature of this group and in such wholesale fashion as attempted by MacGillivray it is little short of disastrous. The peculiar results that can thus be obtained will be discussed in connection with this subfamily.

It is not probable that anything approaching unanimity of opinion concerning the general classification of the Coccidæ will be arrived at for many years to come. There remain too many questions, such for instance as the taxonomic value of the various types of ducts and pores, that are still to be investigated. Doubtless, too, the discovery of new forms will profoundly change some of the present conceptions. As it is, even with the specimens before one, there are many points concerning which the cautious student will hesitate to express an opinion. Yet there are some things that are fairly clear and concerning which an opinion may be hazarded.

My own personal preference would be to regard the Coccidæ as a superfamily in the belief that a more expressive classification can thereby be obtained. However, this is a minor point. What is really desirable is to obtain a division into groups that will approximate a natural arrangement and that are somewhere near equal rank. This I consider that MacGillivray's proposed seventeen subfamilies do not do. I am unable to see that his arrangement is any special improvement over the classifications that have preceded it.

It is my contention that MacGillivray's six subfamilies, Monophlebinæ, Kuwaniinæ, Xylococcinæ, Margarodinæ, Callapappinæ and Ortheziinæ taken together constitute a group that is equivalent in rank to, for instance, the subfamily Diaspidinæ. In working over the Coccidæ I have been impressed with the feeling that the group is at once extraordinarily conservative and extraordinarily plastic, and in no place is this paradoxical condition shown to better advantage than in the six groups mentioned above. There is throughout this group of species a persistent adherence to a certain fairly definite general type, coupled at the same time with aberrations of the most remarkable characters. It is the adherence to this general type and not the aberrations to which I am inclined to accord the most weight.

This group as a whole is characterized by the presence of abdominal spiracles. It is true that in many of the species they have not been recorded, yet there is good reason to believe that this is due simply to deficient observation. In but two genera, *Nipponorthezia* and *Newsteadia*, each with a single species, do they appear positively to be lacking.

MacGillivray in his key to the subfamilies (pp. 58, 59) separates the Ortheziinæ from the other groups named above on the basis of the presence of an anal ring and anal ring setæ. As a matter of fact the anal ring is sometimes developed in the Monophlebinæ, being well developed but simple in

Llaveia bouvari (Sign.) and even more strongly developed with a distinct tendency toward a cellular condition in *Greenella dalbergiae* (Green), although it bears no setæ. MacGillivray further states (p. 106) that the "pilacerores" are peculiar to the Ortheziinæ. Yet they constitute one of the points allying this group with the Monophlebinæ for exactly the same structures are present in, for instance, *Aspidoproctus maximus* Newst. and an apparently undescribed species of *Walkeriana* as well as in other species. Furthermore, the presence of compound eyes in the male of *Orthesia* is additional evidence to the same end.

The Kuwaniinæ, Callapappinæ, Margarodinæ and Xylococcinæ are separated from the Monophlebinæ by the absence of mouthparts in the adult female. Yet in five of the six genera included by MacGillivray in the first named group the mouthparts are present in the adult female, a fact that one drawing conclusions from the literature alone would not be aware of because of deficiencies in the published descriptions. I have elsewhere pointed out that in *Xylococcus macrocarpæ* Coleman the mouthparts are at times developed in the adult female.

The extraordinary development of the anterior legs in the genus *Margarodes* is apparently an adaptive character. Certainly it is hardly sufficient to justify the recognition of this genus as constituting a group equivalent in rank to the Diaspinæ. I have seen no examples of the Callapappinæ, but judging from the descriptions they too are of a Monophleboid type.

It is, of course, obvious that the group formed by the union of these six so-called subfamilies is capable of being subdivided, but this will need to be done on lines somewhat different from those that have previously been employed and on the basis of an examination of material.

In the description of the Monophlebinæ (p. 62) it is stated that the adult female never possesses an anal tube with "anacerores." Such a tube is well developed in *Gueriniella*, which MacGillivray includes in this group. He also includes under this subfamily the remarkable genus *Stictococcus*. I am unable to see in this anything of a Monophleboid character, and would rather adopt Lindinger's view, that it constitutes a separate subfamily.

Under the subfamily Kuwaniinæ the new genus *Americoccus* is proposed for *Matsucoccus fasciculensis* Herbert. I have at hand specimens of this and of *M. matsumuræ* (Kuwana), and cannot concur in the erection of this genus.

Concerning the restoration of the name *Coccus* to the genus which in the Fernald Catalogue is called *Dactylopius*, I cannot comment as the literature upon which a decision depends is not available. I may remark, however, that as Mrs. Fernald's work gives every evidence of having been carefully done, I should be inclined to accept her conclusions, at least until a careful review and restatement of the case has been made. With MacGillivray's assignment of this genus to a position between the Ortheziinæ and the other Monophleboid forms I cannot agree. While it may very well constitute a group by itself it possesses tubular ducts of the type that occur in *Eriococcus* and related forms and that I have not seen in any of the Monophleboid forms that I have examined. The association of *Epicoccus* with this genus is dubious.

I have never been privileged to examine specimens of the female of *Phenacoleachia* but I have at hand males sent me by Professor Cockerell as belonging

to *P. zealandica*. On the basis of these males and of the meager description given by Maskell I should regard this genus as a *Pseudococcine* form of the general type of *Puto*. The males of these two genera are practically identical. I see no reason for retaining the subfamily *Phenacoleachiinæ*.

The subfamily *Eriococcinæ* as understood by MacGillivray is certainly an unnatural group, and as he has indicated (p. 126) includes at least two groups of genera. MacGillivray's remarks (pp. 122-3) indicate that he is not aware that the dorsal ostioles or "labiæ" do not occur in *Eriococcus* and the genera related to it. They are in fact confined to the genera of which *Pseudococcus* may be taken as the type, and I regard their possession as of sufficient importance to justify a distinction between these two groups. On the other hand, MacGillivray has excluded from the *Eriococcinæ* the genus *Kermes*, which I regard as strictly *Eriococcine*. I shall consider this point under the discussion of the subfamily *Kermesinæ*.

The subfamily or group associated with *Eriococcus* includes the following genera of the position of which I feel sufficiently sure to hazard an opinion: *Atriplicia*, *Cryptococcus*, *Eriococcus*, *Fonscolombia*, *Gymnococcus*, *Gossyparia*, *Kermes*, *Micrococcus*, *Olliffiella*, *Rhizococcus* and *Xerococcus*. The group associated with *Pseudococcus* contains the following: *Antonina* (= *Chaetococcus*), *Cryptoripersia*, *Erium*, *Geococcus*, *Helicoccus*, *Heterococcus*, *Lachnodius* (at least in part), *Macrocepicooccus*, *Naiacoccus*, *Natalensia*, *Nesococcus*, *Phenacoccus*, *Porococcus*, *Pseudococcus*, *Puto* (= *Ceroputo* = *Macrocerococcus*), *Ripersia*, *Ripersiella*, *Rhizoecus*, *Sphaerococcus*, *Trionymus* and *Tylococcus*.

Ehrhornia, *Paludicoccus* and *Kuwanina* are of doubtful affinities, but I feel sure do not belong in either of the above groups. *Cissococcus*, as I have pointed out in an earlier number of these notes is a *Lecaniine* form. The species described by Ehrhorn as *Cissocossus* (?) *oahuensis* has since been referred by Ehrhorn to a new genus, *Phyllococcus*, which has been overlooked by MacGillivray. I have at hand specimens of this species but prefer not to express any opinion as to its relationships.

The other genera included by MacGillivray in his *Eriococcinæ* I have not seen specimens of, nor in some cases the descriptions, and I refrain from commenting upon them.

I may note a misstatement on page 142. It is there said that "Ferris believes that the American *Phenacoccus stachyos* Ehrh. is congeneric" with *Coccura comari* (Sulc). It is *Helicoccus bohemicus* Sulc with which I have compared *P. stachyos*.

In regard to the *Tachardiinæ* I may simply note that the statement that the body is not provided with pores, "cerores," or with tubular ducts, "ceratubæ," except on the stigmatic and anal processes is entirely erroneous as an examination of carefully stained specimens will quickly show. MacGillivray has adopted Cockerell's groups and although these will stand they will not do so on the basis of the characters used.

The keys and discussion of the *Lecaniinæ* are based entirely upon the literature and no new genera are named. I may note only that the anomalous genus *Aclerda*, which probably does not belong in this group is included without special comment, and that it is stated (p. 175) that in this genus the anal cleft and opercula are wanting. The anal cleft is present and bears at its anterior

end a single undivided plate. Also no mention is made of the fact that in *Physokermes* the opercula are wanting in the adult female, in fact (p. 175) it is said that the adult female has the "opercula prominent, swollen, dorsal in position." The structures referred to are not the opercula, which are lacking in this stage.

Concerning the Asterolecaniinae I shall note only that to it is referred the genus *Olliffiella*. I reaffirm the opinion which I have formerly expressed, that this species is closely related to *Kermes* and should accompany the latter wherever it may be placed.

The subfamily Kermesinae is based upon the single genus *Kermes*. As I have previously indicated I regard this genus as strictly Eriococcine, and see no reason for the subfamily Kermesinae. I may note that MacGillivray's statement (p. 191) that the anal ring is wanting in the adult female is erroneous. In *K. cockerelli*, *kingii*, *nigropunctatus* and *vermilio*, at least, the anal ring is well developed in the adult female, although it bears no setae.

(To be continued.)

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENERA MELANOCHELIA RONDANI AND LIMNOPHORA R.-D. (DIPTERA, ANTHOMYIIDÆ.)

BY J. R. MALLOCH,
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This group is the *Limnophora* of authors, the name *Limnophora* being applicable to the species which have the prosternum and base of third vein setulose; the other segregate requires a change of name and apparently Rondani's name must be used.

The species of *Melanochelia* occur most commonly in the north and usually along the margins of lakes or streams. *Limnophora* occurs more commonly in the south, many species being found in the tropics throughout the world, and even very frequently on small islands far removed from the large land masses. The larvæ are, so far as I know, aquatic.

Melanochelia Rondani.

KEY TO SPECIES.

1. Thorax with four pairs of postsutural dorsocentral bristles; halteres yellow (cf. *obsoleta*).....2.
- Thorax with four pairs of postsutural dorsocentral bristles; halteres black or brown.....13.
- Thorax with three pairs of postsutural dorsocentral bristles.....19.
2. Orbital hairs descending much below level of base of antennæ; facial ridges haired about midway to base of antennæ; basal abdominal sternite haired.....*Lispoides aequalis* (Stein).
- Orbital hairs not descending below base of antennæ.....3.
3. Basal abdominal sternite with some setulose hairs; fourth wingvein usually slightly curved forward at apex.....*Eulimnophora* Malloch.
- Basal abdominal sternite bare.....4.
4. Eyes of male separated by much less than distance across posterior ocelli; sternopleurals 1:1; anterior acrostichals in two series; hind tibia with one anterodorsal and one anteroventral bristle.....*torreyæ* Johannsen.

- Eyes of male separated by as great a distance as width across posterior ocelli; characters not in all respects as above.....5.
- 5. Males.....6.
- Females.....11.
- 6. Calyptræ dark brown; eyes separated by one-third of the head-width; frons velvety black; hind femur with bristles on entire length of posteroventral surface.....*velutina* Malloch.
- Calyptræ whitish or yellowish; species not as above in other respects.....7.
- 7. Small species, not over 4 mm. in length, densely white pruinescent; presutural acrostichals strong, two-rowed; females of known species without paired spots on abdomen, and the genitalia with two or four short thorns at apex.....8.
- Larger species, over 5 mm. in length, brownish gray pruinescent; presutural acrostichals in at least three series; females without thorns on genitalia.....9.
- 8. Fourth abdominal tergite distinctly longer than third; cheek but little higher than width of parafacial at base of antenna; abdomen silvery, third tergite without paired spots.....*argentiventris* Malloch.
- Fourth abdominal tergite not longer than third; cheek twice as high as width of parafacial at base of antenna; abdomen whitish gray, not silvery, third tergite with a pair of small spots.....*brevicornis* Malloch.
- 9. Hind femora with long bristles on antero- and posteroventral surfaces, those on the latter finer than on the former, and not extending to base.....*novæ-anglæ* Malloch.
- Hind femora with at most very short bristles on posteroventral surface, those on anteroventral long and strong, but confined to apical half....10.
- 10. Hind femur with a number of short, erect bristles on median portion of posteroventral surface; eyes separated by less than width across posterior ocelli; each orbit as wide as interfrontalia....*gibsoni* Malloch.
- Hind femur without median posteroventral bristles; eyes separated by width across posterior ocelli; each orbit about half as wide as interfrontalia.....*monticola* Malloch.
- 11. Lower calyptra hardly protruding beyond upper; costal setulæ longer than diameter of costal vein.....*obsoleta* Malloch.
- Lower calyptra projecting much beyond upper; costal setulæ not as long as diameter of costal vein.....12.
- 12. Small species, not over 4 mm. in length; thorax and abdomen with grayish white pruinescence, without dorsal spots; genitalia of female with some strong apical thorns.....*brevicornis* Malloch.
- Larger species, averaging over 5 mm. in length; thorax and abdomen with brownish pruinescence, the former vittate, the latter with paired dorsal spots.....*nobilis* Stein.
- 13. Presutural acrostichals consisting of two very closely placed, rather irregular series of short setulæ; abdomen with a linear dorsocentral black vitta and black paired dorsal spots; basal segment of hind tarsus a little less than half as long as hind tibia; basal separation of antennæ linear.....*tetrachæta* Malloch.
- Presutural acrostichals consisting of four or more series of fine hairs;

- abdomen with paired dorsal spots which are sometimes fused or without distinct spots, and never with a dorsocentral vitta.....14.
14. Calyptræ exceptionally small, the lower one not twice as large as the upper; abdomen with the dorsal spots so greatly enlarged as to cover the entire dorsum except the extreme posterior margin of each tergite; costal hairs setulose, very distinctly longer than diameter of costal vein; vibrissal angle not noticeably produced beyond line of base of antennæ.....*obsoleta* Malloch.
- Calyptræ large, the lower one twice as large as the upper; abdomen with distinct paired dorsal spots; costal setulæ minute; if the abdomen is indistinctly spotted the vibrissal angle is produced much beyond a vertical line drawn from base of antennæ.....15.
15. Vibrissal angle but little produced, almost in vertical line with base of antennæ.....16.
- Vibrissal angle very conspicuously produced beyond vertical line from base of antennæ.....17.
16. Small species, not 4 mm. in length; abdomen unspotted, the entire body with whitish pruinescence; genitalia with 4 short thorns.....*brevicornis* Malloch.
- Larger species at least 5 mm. in length; abdomen with large black paired spots, the entire body with brownish pruinescence.....*nobilis* Stein.
17. Hind femur with 4 or 5 moderately stout, long bristles on apical two-fifths of anteroventral surface; last section of fourth vein three times as long as preceding section; veins 2 and 4 up to outer cross-vein and both cross-veins tinged with brown along their courses.....*pearyi* Malloch.
- Hind femur with long, hair-like bristles from base to apex on anteroventral surface; last section of fourth vein less than twice as long as preceding section; veins not tinged with brown.....18.
18. Large species, at least 6 mm. in length; female orbits with rather dense bristly hairs laterad of the bristles; the hairs almost as long as the bristles; wings of male rather pointed at apices.....*angulata* Malloch.
- Smaller species, not over 4.75 mm. in length; female with short sparse hairs laterad of the bristles on orbits; wings of male rounded at apices.....*extensa* Malloch.
19. Calyptræ dark brown; wings distinctly infuscated; eyes of male separated by much less than width across posterior ocelli.....*anthrax* Bigot.
- Calyptræ whitish; halteres yellow; wings usually clear.....20.
20. Eyes separated by almost one-third of the head-width; hind femur without posteroventral bristles; the paired dorsal abdominal spots with a connecting brown patch between them.....*caroli* Malloch.
- Eyes separated by much less than one-third of the head-width; abdominal dorsal spots not as above.....21.
21. Hind tibia with one or more setulæ at or near middle on posterodorsal surface.....22.
- Hind tibia without setulæ on posterodorsal surface.....27.
22. Tibiæ pale, reddish; wings clear, veins pale; abdomen narrow, cylindrical, the dorsal spots of moderate size, widely separated; fore tibia with a median posterior bristle.....*suspecta* Malloch.

- Tibiæ black; wings usually infuscated, more distinctly so basally, veins black; abdomen ovate except in *alticola*, the dorsal spots large, separated by a linear space; fore tibia without a median posterior bristle except in *alticola*.....23.
- 23. Eyes separated by more than twice the width across posterior ocelli; hind femur with long bristly hairs on basal half of posteroventral surface....24.
- Eyes separated by less than twice the width across posterior ocelli.....25.
- 24. Fifth abdominal sternite with a chitinous protuberance near apex on each side of posterior excavation; mid femur without strong bristles at base on posteroventral surface.....*acuticornis* Malloch.
- Fifth abdominal sternite without such protuberance; mid femur with strong bristles on basal half of posteroventral surface.....*surda* Zetterstedt?.
- 25. Abdomen cylindrical, slightly tapered apically; hind femur with long bristly hairs on basal half of posteroventral surface; eyes separated by more than width across posterior ocelli.....*alticola* Malloch.
- Abdomen ovate; hind femur without long bristly hairs on posteroventral surface; eyes separated by less than width across posterior ocelli.....26.
- 26. Fifth abdominal sternite with sparse setulose hairs laterad and distad of base of posterior excision; abdominal dorsal spots separated by a linear space.....*magnipunctata* Malloch.
- Fifth abdominal sternite with very dense short setulæ laterad and distad of base of posterior excavation; the dorsal abdominal spots on third and fourth tergites rather widely separated, much more so than those on second.....*imitatrix* Malloch.
- 27. Thorax when viewed from behind with the anterior half of disc brownish black, the posterior half densely gray pruinose; abdominal dorsal spots narrow, elongate, sometimes linear; mid tibia without an antero-dorsal bristle; hind femur unarmed on posteroventral surface.....*clivicola* Malloch.
- Thorax deep black when viewed from behind, only the posterior margin grayish pruinose; abdominal dorsal spots large and broad; mid tibia with one or more anterodorsal bristles; hind femur with some short, stout bristles on median third of posteroventral surface.....*gibsoni* Malloch.

Limnophora Robineau-Desvoidy.

KEY TO SPECIES.

- 1. Fifth abdominal sternite in male much longer than fourth; male hind femur incrassated at base and apex.....*incrassata* Malloch.
- Fifth abdominal sternite in male not longer than fourth; femora normal..2.
- 2. Eyes of male narrowly separated, the frons not wider than third antennal segment; first posterior cell of wing much narrowed apically.....*narona* Walker.
- Eyes of male separated by more than width of third antennal segment; first posterior cell of wing almost imperceptibly narrowed apically....3.
- 3. Female with an anterodorsal bristle on mid tibia.....*groenlandica* Malloch.
- Female without an anterodorsal bristle on mid tibia.....*discreta* Stein.

FURTHER NOTES ON EVENING FLOWERS, PANURGINE AND HALICTINE BEES.

BY O. A. STEVENS,
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The present paper is supplementary to two previously published on these forms (Can. Ent. 51:205-210, Ent. News 31:35-44). Through the kind co-operation of my friend Dr. J. F. Brenckle I was able to make a fourth visit to the sand hills near Sheldon, North Dakota, and succeeded in obtaining the females of *Hesperapis carinata* and *Perdita tridentata*.*

Notes on nesting of *Agapostemon splendens* were also secured and these with data on the other species and of *Augochlora* in North Dakota are presented. I am inclined to regard these two groups as subgenera of *Halictus* as has been done by Ducke and Viereck.

No further data of interest on other panurgine bees in North Dakota has been obtained, but the absence of *Greeleyella* at Rugby might be noted. It was looked for there on June 30th to July 4th, but is doubtless an austral species which does not extend quite that far (see Am. Journ. Bot. 7:231-242 for notes on distribution of plants in the state).

***Hesperapis carinata* Stevens.**

1919. *Hesperapis carinata* Stevens, Can. Ent. 51:209, male.

Female.—Length about 12 mm. Very similar to male but stouter, hair bands of abdomen prominent and cream coloured. Face sub-quadrate, sparsely hairy on occiput, sides, around antennæ bases, sides and anterior edge of clypeus; clypeus bare or nearly so on median part, shining, rather finely but not very closely punctured; vertex smooth and shining, antennæ reddish beneath, browner above, mandibles toothed.

Mesoscutum inclined to be bare medially with a few, short, dark hairs. A well developed scopa of rather stiff, short-branched hairs on posterior tibia and basitarsus (femur and trochanter with only a few short hairs) that of the basitarsus distinctly parted on posterior edge (Fig. 1-b). Sixth dorsal segment narrowed, truncate, somewhat concave with a low raised triangle on basal middle (Fig. 1-c); laterally this segment is pubescent as in the male, the dorsal concave surface slightly striate. Wing nervures a variable pale brown, darker than in the male.

Nine specimens at flowers of *Helianthus petiolaris* in the sand hills near Sheldon, North Dakota, Aug. 21, 1920. Allotype No. 12688. When first attempting in 1916 to determine this bee, I was much puzzled as to its generic position, unless it belonged in *Hesperapis* of which I had neither descriptions nor specimens. Prof. Cockerell reported it as a new species of *Halictoides*. Mr. J. C. Crawford, however, when specimens were sent to the U. S. National Museum, wrote that it was a *Hesperapis* and called attention to the Y-shaped carina as distinctive. The general appearance of both sexes is much that of a *Colletes*. The stigma is poorly developed and is pale medially. The scopa is not similar to our other panurgines and the cleft in that of the basitarsus is unique as far as I know.

*Types and allotypes of these are in U. S. Nat. Mus.; a paratype and metatype of *Hesperapis*, metatypes of *Hesperapis*, *Perdita* and *Halictus oenotheræ* in Acad. Nat. Sci. of Phila. March, 1921

The type of *Hesperapis* (*H. larræ* Ckll.) was described as parasitic, but Prof. Cockerell writes that such idea was erroneous. None of the *carinata* females were carrying a full load of pollen, although two seem to have a small amount which had been moistened. I believe it is a regular *Helianthus* bee and that it was yet early for them to be collecting. The day was not very favorable although some species of *Perdita* and *Andrena* were busily collecting on the sunflowers. None of the females had been found on a warm, windy afternoon two days before (two males on each day). This, the fourth visit to the place, was made later this year, bearing in mind the general rule of protandry and the extreme case of the closely related *Rhophites* as cited by Friese (Zool. Jahr., 1890). Several males were taken Aug. 10, 1919, inactive on the sunflowers' heads all day.

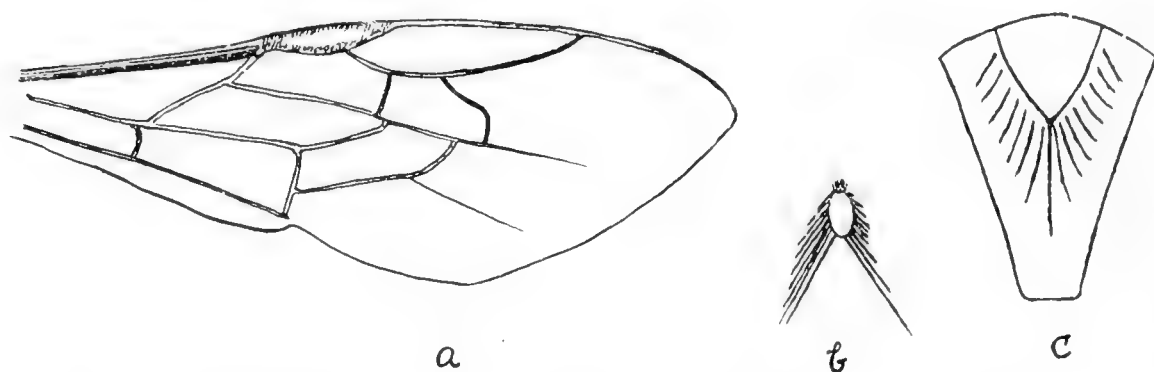


Fig. 1. *Hesperapis carinata*, female; a, forewing; b, hind basitarsus in cross-section; c, sixth dorsal segment of abdomen.

***Perdita tridentata* Stevens.**

1919. *Perdita tridentata* Stevens, Can. Ent. 51:206, male.

Female.—Length about 6 mm. Similar to the male; head and thorax bronzed greenish blue, clypeus, legs and abdomen dark brown. Face without yellow markings, mandibles reddish, antennæ yellowish beneath, brownish above; abdomen with transverse yellow spots on second and third segments, the first usually with smaller ones; fore tibiae with a yellow stripe.

Sixteen specimens at *Helianthus petiolaris* in the sand hills near Sheldon, N. D., Aug. 28, 1920. Allotype No. 12662. The spots on first segment are sometimes absent or nearly so, sometimes proportionately as large as the others, which are separated by a space about equal to their length. The females were collecting pollen. It took also 5 males, and on Aug. 10, 1919, at same place on the same flowers, 2 males.

This seems to be close to *sexmaculata* Ckll. (1895) and its var. *punctata* Ckll. (1896), but I judge probably distinct. It has no spots on segment 4, mandibles not yellow, stigma hyaline medially, cubital and discoidal nervures not especially produced, tarsi all dark. Mr. E. T. Cresson Jr., has compared specimens with the type of *sexmaculata* and reports: "*tridentata* has more granulose bronze vestiture; the other being polished with scarcely any bronze. *Sexmaculata* abdominal spots are round or slightly transverse, and are also present on segs. 4–5. Its fore tibiae are yellow in front and black behind."

***Agapostemon viridulus* (Fab.)**

Fargo, Nicholson, Monango, Glen Ullin, Mott, Marmarth, Dickinson

and Minot; 26 females, June 25, July 1, 3, 4, 7, 14, 16, 18, 25 and 27 at flowers of *Brauneria pallida*, *Carduus undulatus*, *Lactuca pulchella*, *Onagra strigosa*, *Opuntia humifusa*, *Petalostemon purpurea*, *Rosa*, *Sisymbrium altissimum* and *Taraxacum taraxacum*; 5 males, Sept. 15, 20, and 25 at flowers of *Aster chinensis*, *A. paniculatus* and *Helianthus maximiliani*.

***Agapostemon radiatus* (Say).**

Fargo and Mandan; 14 females, May 14, 26, June 17, 26, Aug. 7, Sept. 8 at flowers of *Dracocephalum parviflorum*, *Erigeron philadelphicus*, *Oxalis stricta*, *Physalis ixiocarpa*, *Ribes missouriensis*, *Rosa*, *Salix*, *Symphoricarpos occidentalis* and *Taraxacum taraxacum*; 21 males, Aug. 7, 11, 13, 25, Sept. 6, 8, 11, 15, 18, 27 and Oct. 15, at flowers of *Aster paniculatus*, *A. sagittifolius*, *Bidens frondosa*, *B. vulgata*, *Grindelia squarrosa*, *Medicago sativa*, *Melilotus alba*, *Physalis ixiocarpa* and *Physostegia parviflora*.

Also females from Minneapolis, Minnesota, at *Aquilegia* (Nevada S. Evans), Webster City, Iowa, on *Syringa vulgaris* (J. R. Campbell), and Blue Rapids, Kansas, *Oxalis stricta* (Edna M. Stevens); a male from Blue Rapids at *Helianthus tuberosus*.

***Agapostemon texanus* (Cress.).**

Fargo, Venlo, Lisbon, Nicholson, Monango, Oakes, Kulm, Gascoyne, Bowman, Valley City, Jamestown, Mandan, Glen Ullin, Mott, Dickinson, Washburn, Pleasant Lake, Minot, Williston, and Schafer; 92 females, Apr. 29 May 5, 11, 13, 17, June 2, 4, 5, 14, 16, 26, 28, July 1, 3, 4, 7, 10, 11, 18, 21, 25, 26, 27, Aug. 9, 12, 13, 17, Sept. 5, 10, 17, Oct. 22 and 31; at flowers of *Aster chinensis*, *Brassica arvensis*, *Brauneria pallida*, *Cactus viviparus*, *Carduus undulatus*, *Centaurea jacea*, *Cerastium arvense*, *Chrysopsis villosa*, *Dracocephalum parviflorum*, *Erysimum asperum*, *Gaillardia aristata*, *Gaura coccinea*, *Grindelia squarrosa*, *Helianthus annuus* (cult.), *H. petiolaris*, *Homalobus tenellus*, *Lactuca pulchella*, *Malvastrum coccineum*, *Medicago falcata*, *M. sativa*, *Onagra strigosa*, *Opuntia humifusa*, *Pentstemon albidus*, *P. gracilis*, *Prunus americana*, *Ratibida columnaris*, *Ribes setosum*, *Rosa*, *Rudbeckia laciniata*, *Senecio perplexus*, *Spiraea salicifolia*, *Symphoricarpos occidentalis*, *Taraxacum taraxacum*, and *Trifolium repens*; 37 males Aug. 7, 11, 13, 14, 17, 18, 24, 25, 30, 31, Sept. 5, 6, 8, 10, 13, 15, 17, 19, 20, 21, 27, Oct. 1, 14, 22, 27 at flowers of *Allionia hirsuta*, *Aster chinensis*, *A. laevis*, *A. multiflorus*, *A. paniculatus*, *Boltonia asterioides*, *Centaurea jacea*, *Erucastrum pollichii*, *Grindelia squarrosa*, *Gutierrezia sarothrae*, *Helianthus maximiliani*, *Physalis ixiocarpa*, *Physostegia parviflora* and *Sideranthus spinulosus*.

This is by far the most common species of the group in North Dakota and one of the most common bees. The earliest Fargo record which I have is Apr. 29, 1913, (C. H. Waldron). The October records are all in 1915, but the past year a male was seen Oct. 20, and both sexes quite abundant in the early part of the month, the fall having been mild except for one heavy frost on Sept. 29.

A single female from Ft. Douglas, Utah, (J. F. Brenckle, May 5, 1918, at *Balsamorhiza sagittata*) differs somewhat in the sculpture of the propodeum. It has a fairly distinct enclosure, from which run laterally about a dozen prominent ridges, converging slightly on the angle.

I have also 6 females from Denver, Colo., 3 at *Cleome serrulata* and 1 at *Sisymbrium altissimum* (Edna M. Stevens, July 5, 1915). Two of these and

one or two of the North Dakota specimens show rather straight, coarse ridges on the propodeum, on the rest it is more reticulate with fine ridges, an enclosure often suggested but not well developed.

Agapostemon splendens (Lep.).

Fargo, 3 females Oct. 15, 21 and 27, 1915, at *Grindelia squarrosa* and *Taraxacum taraxacum*; Sheldon, Aug. 28 and 30, 1920; 5 females; 5 males at Sheldon, Aug. 10, 1918, and one at Sentinel Butte Aug. 30, 1914. The male from Sentinel Butte and one of those from Sheldon have the first abdominal segment entirely black at base instead of yellowish medially.

In the sand hills near Sheldon this bee was found nesting on the sides of a "blow out" where the sand was fairly stable and sparsely covered with grass tufts. A female was seen at a hole so I decided to attempt an excavation of a similar opening. The one selected showed particles of pollen near the opening. The shaft proved to be about 8 mm. in diameter and vertical for about 1 m. Here it was lost but a lateral was found which extended irregularly somewhat backward and downward for about 3 dm. Two other similar branches, supposedly of the same shaft were found, the second about 6 cm. below the first. An enlargement of the end of the branch formed the single cell which was smooth within but fell to pieces at a touch. A ball of pollen found in No. 2 was nearly spherical, 8 mm. in diameter. The first contained pollen but was disturbed in digging, the second apparently spoiled pollen.

Three other nests were opened and in each the female was found working on the vertical shaft, two at a depth of 1 m., and one at 1.5 m. Many other similar openings were seen, perhaps one or two per meter in suitable parts of the bank. Some were open, some closed, usually surrounded by a very small handful of sand.

Augochlora confusa (Rob.).

This is not at all common. I took at Fargo a female at *Hydrophyllum virginicum*, another at *Zizia aurea* on June 14, 1913; one at *Grindelia squarrosa*, Aug. 17, 1911. On June 23, 1917, I found them quite abundant, collecting pollen of *Erigeron philadelphicus*; on Aug. 25, and Sept. 11 of same year common at *Aster paniculatus*, also *A. laevis*, *Solidago canadensis*, and *Vernonia fasciculata*; males at *Helianthus maximiliani*, *H. tuberosus*, and *Solidago canadensis*.

Halictus texanus (Cress.).

My sister, Edna M. Stevens, sent me females taken at Blue Rapids, Kans., May 30, 1920, the same place that I found them the year before (Ent. News 31:36). She found them abundant at the *Megapterium* flowers about 7.30 p.m., but saw only one at 8.30. On June 10, at another place about two miles distant she found them at 8.30, a single one at *Achillea millefolium*.

Halictus oenotheræ (Stevens).

Three females, May 30, 1920 (with the *texanus*), one bearing a full load of pollen as I have described for *texanus*.

Halictus aberrans (Crawford).

A small amount of data relative to time of flight (females only) and opening of *Gaura coccinea* flowers was obtained the past season at Rugby, N. D.

- June 29, 6 p.m.—flowers opening, bees active.
 “ 29, 6 “ —bees less active; sunset at 8.40.
 “ 30, 7–8 a.m.—a few bees.
 “ 30, 5 p.m.—no flowers open, several bees at old ones; old flowers removed from three plants.
 “ 30, 6 “ —5, 5, and 6 flowers open on the 3 plants; bees active.
 “ 30, 7 “ —9, 18, and 13 flowers open on the 3 plants.
 “ 30, 8 “ —2, 6 and 2 flowers open on the 3 plants.
 “ 30, 9 “ —0, 0 and 0 flowers open on the 3 plants; no bees.

This shows clearly that the main period is from one to two hours before sunset. Some plants of *Anogra pallida* were watched at same time. Three flowers opened at 9 p.m., but no visitors were seen in the next half hour. One specimen of *Autographa falcifera* Kby., apparently the moth referred to (Ent. News 31:43), was taken at *Gaura* in the evening, two of *Rhodophora florida* Gn. at *Anogra* in the morning (det. by Henry Skinner and deposited in the Acad. Nat. Sci. collection).

A NEW GENUS AND A NEW SPECIES OF SPIDERS IN THE GROUP PHRUROLITHEÆ.

BY RALPH V. CHAMBERLIN,
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Phruronellus, gen. nov.

Proposed for a group of species heretofore included in *Phrurolithus*. The males are characterized by having near the proximal end of the femur, or sometimes at the middle, beneath, a conspicuous but short apophysis which is usually bent at the end, in place of the simple swelling at the distal end of femur present in species of *Phrurolithus* sens. str. Also by having the tibial apophysis with two distinct prongs united at base. The cephalothorax is more nearly circular in outline, the head region less narrowed, and differing in being uniformly dark

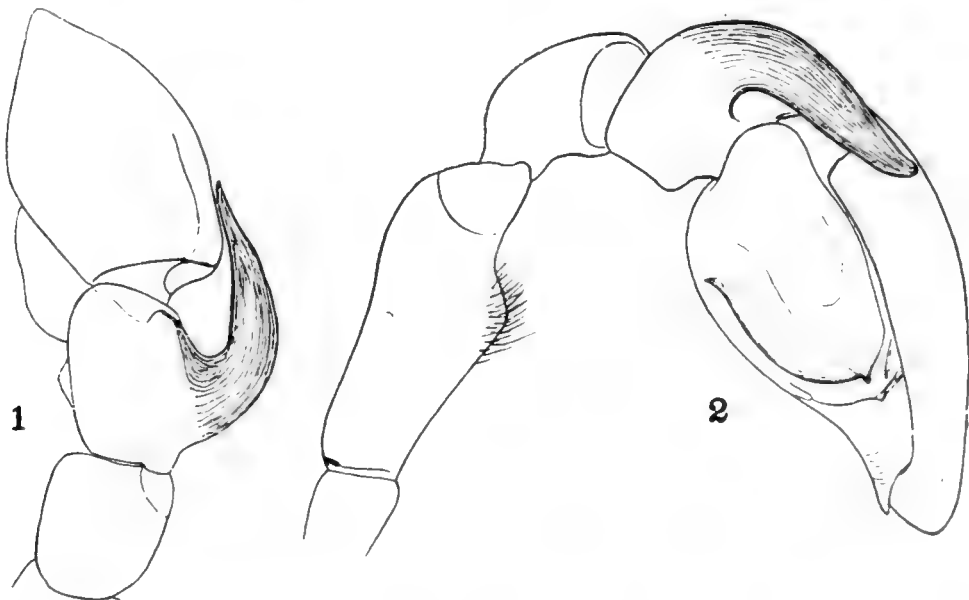


Fig. 1. *Phrurolithus parallelus*, sp. nov. (1) dorsal view, (2) sublateral view of male palpus.

shiny chestnut or blackish, without any definite markings such as are present in *Phrurolithus*. First legs without the tibiae conspicuously black, as in the latter

genus. Femora usually darker than distal joints, especially on first two pairs of legs. Abdomen also dark above with markings obscure or absent.

Genotype.—*Phrurolithus formica* Banks.

Other known species in this genus are *pugnatus* (Emerton) and *similis* (Banks), the *Phrurolithus affinis* of Banks being the same species as the *pugnatus* of Emerton. The North American species remaining in *Phrurolithus* sens. str. are *alarius* (Hentz), *borealis* Emerton, *minutus* Banks, *parcus* (Hentz), probably *britcheri* Petrunkevitch, which species is unknown to me, and the new species described below.

***Phrurolithus parallelus*, sp. nov.**

Male.—Carapace yellow, lateral margins black, sides a little dusky, with deeper branched lines as in *borealis*. Legs yellow excepting the first pair which have the femur, patella and tibia, excepting the light distal end of latter, darkened, the tibia darkest. Sternum yellow. Abdomen above dark, almost black, without markings, pale beneath with two darker lines united in front of spinnerets and extending forward to middle. Abdomen narrow with anterior corners angular and the margin between them but little convex, the sides subparallel. Femur of male palpus with a rounded swelling beneath at distal end covered with stiff hairs, this not limited on ectal side by a non-pilose, keel-like elevation such as is present in *alarius*. Tibial apophysis geniculate at base as usual, rather short, of gradually decreasing width to acute apical part, the latter not bent or twisted. (See Fig. 1.)

Length, 2.3 mm. Length of cephalothorax, 1 mm.; width .86 mm. Length of tib. + pat. IV, 1.4 mm.; of tib. + pat. I, 1.23 mm.

Locality.—Washington, Wawawai. One male.

NEW PARASITIC HYMENOPTERA OF THE SUBFAMILY
ANTEONINÆ (DRYINIDÆ).

BY F. A. FENTON,
Ames, Iowa.

The *Anteoninae*¹ comprises a small but well-differentiated group of hymenopterous insects parasitic on leaf and treehoppers (*Homoptera*). One of the striking characteristics of these insects is the fact that with the exception of one tribe, all the females have the anterior tarsal joints modified to form a chela or grasping organ. In the more specialized genera there is a marked sexual dimorphism, the females being wingless and ant-like.

During the summer of 1919 the following species were collected or reared from leafhoppers and have been carefully compared with related species and are considered new.

***Epigonatopus americanus*, n. sp.**

Female.—This species differs greatly in colour from *solitarius* Perkins and in body sculpture from *fallax* Perkins. Length 2.5–2.75 mm. Black except tips of coxæ, trochanters, generally tibiæ and tarsi, basal three to four antennal joints, and face below base of antennæ, which are testaceous. Antennæ twice length of head. Vertex of head flat; surface of head and prothorax

1. This group has been variously given the rank of family (*Dryinidæ*) and subfamily (*Anteoninæ*) by different writers. It is also included by some in the superfamily *Proctotrupoidea* and by others in the *Vespoidea*.

polished and with minute punctures, thoracic constriction minutely tuberculate, anterior half of propodeum smooth and polished dorsally, posterior half densely and minutely punctate. Abdomen smooth and polished. Thorax with few scattered hairs, these more numerous ventrally.

Described from five specimens collected by E. D. Ball, Ames, Iowa, July 25, 1919. This species was found associated with *Balclutha impicta* Van Duzee nymphs and was probably parasitic on this insect since this was by far the most abundant species of leafhopper on an annual species of *Panicum*. Owing to the large series of specimens the writer was able to dissect for the character of the mouth parts and the maxillary palp was found to be very short and two-jointed. This fact places this species in the genus *Epigonatopus* Perkins in which there are but two species described, *solitarius* and *fallax* from Australia.

Gonatopus agropyus, n. sp.

Female.—Comes nearest to *bicolor* Ashm. but differs especially in colour of abdomen. Length 2 mm. Testaceous, except basal three joints of antennæ and abdominal petiole which are fuscous. Abdomen varies from partly to entirely fuscous. Antennæ short, slightly longer than head. Head and prothorax smooth and polished, thoracic constriction and central elevated part of propodeum minutely punctate, anterior part of propodeum rugose, posterior part distinctly transversely aciculated. Abdomen smooth and polished.

Male.—Length 2.3 mm. Black, body covered with fine scattered hairs; antennæ as long as head and thorax together, pubescent. Maxillary palpi extending almost to posterior margin of head, with three joints visible; mandibles fuscous. Antennal joints 1 and 2 subequal, together being slightly shorter than 3; 3, 4, 5 and 6, subequal, each succeeding joint slightly shorter than preceding; 7–10 shorter, subequal. Ocelli all visible from above. Prothorax not visible from above; eyes pubescent; mesothorax shining and very finely reticulate. Parapsidal furrows distinct, converging and meeting at posterior margin of mesothorax; scutellum much shorter than mesonotum, smooth and polished; propodeum distinctly rugose. Wings hyaline, and clothed with fine hairs. Venation pale, radius curved, extending almost to margin of wing.

Described from one male and two females reared from *Deltocephalus affinis* nymphs collected by the writer at Ames, Iowa, July 19 and September 25, 1919.

A female reared from *Deltocephalus affinis* adult collected by the writer at Ames, Iowa, September 24, 1919, is apparently the same species. In coloration and body sculpture it is practically identical but it is somewhat larger, measuring 3 mm. in length.

Gonatopus similis, n. sp.

Female.—Resembles *mimoides* Perkins but differs in character of thoracic and propodeal sculpturing. Length 3 mm. Testaceous, except basal two joints of antennæ, vertex around ocelli, petiole, and posterior half of abdomen which are fuscous to black. Antennæ long, two to three times length of head. Head and prothorax smooth and polished. Thoracic constriction minutely tuberculate, propodeum finely reticulately sculptured. Abdomen smooth and polished. Thorax and abdomen with scattered hairs.

Described from a single specimen reared from *Deltocephalus affinis* nymph collected July 24, 1919, at Ames, Iowa.

ADDITIONS TO AGRILUS BIBLIOGRAPHY.

BY C. A. FROST AND H. B. WEISS,
New Brunswick, N. J.

The following references were inadvertently omitted from the bibliography published in this journal September and October, 1920.

A. subtropicus Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 131, 1905.

Collected on *Momisio pallida* (Schaeffer).

A. huachucae Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 150, 1905.

On oak (Schaeffer).

A. dolli Schaeffer.

Schaeffer, Jour. N. Y. Ent. Soc., vol. XII, p. 210.

Taken from branches of *Acacia flexicaulis* (Schaeffer).

A. quercus Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 150, 1905.

On oak (Schaeffer).

CORRECTION OF A STATEMENT CONCERNING THE TERMINAL ABDOMINAL STRUCTURES OF MALE INSECTS.

BY G. C. CRAMPTON, PH. D.
Massachusetts Agricultural College, Amherst, Mass.

The statement that the gonopods (outer claspers, representing modified styli) of male insects probably represent the dorsal valvulae of the ovipositor of the female (Canadian Entomologist, LII, 1920, p. 180) is somewhat misleading, and should be corrected. The gonopods of the male probably represent the *styli* borne at the tips of the dorsal valvulae of the ovipositor of the immature females of certain roaches, phasmids, grylloblattids, etc., (or the adults of certain sawflies, Odonata, etc.), rather than the dorsal valvulae themselves, and it is, therefore, more exact to state that the gonopods of the male correspond to the valvular styles of the female insect. The dorsal valvulae of the ovipositor of the female insect are probably modified "coxites" (ovicoxites) corresponding to the "coxites" of the gonopods (gonocoxites) of the male insect, and the gonopods and styli doubtless represent exopodites, while the penis valves and inner valvulae of the ovipositor probably represent endopodites of a pair of limbs whose basal segments are represented by the ovicoxites in the female (dorsal valvulae) or the gonocoxites in the male insect.

It is possible that the penis valves of male ephemerids, sawflies, etc., (i. e., the endopodites of a modified limb) do not strictly correspond to the phallic lobes of male roaches, etc., since the latter may represent merely outgrowths of the intersegmental membrane between the ninth and tenth sternal regions. Furthermore, it is quite possible that the so-called surhami or hook-like processes of the parapodial plates of certain roaches are merely modified processes of the tenth tergite, which have become secondarily united with the parapodial plates. This, and several other points of a similar nature, will be discussed more at length in a later paper.

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Owing to the high cost of production, the Executive Council of the Entomological Society of Ontario has decided that author's separates can no longer be supplied free of charge, and, if desired, must be paid for at the current rates.

It will further be necessary to ask authors to bear the entire cost of reproduction of all illustrations used in their articles, this to include the cost of coated paper inserts where such are required.

It is realized that the above course is bound to work a certain amount of hardship on authors and reduce materially the value of many articles. Since, however, the only alternative—if the Canadian Entomologist is to continue as a publication—would be a considerable increase in the subscription price or a reduction in the size of the journal, it is felt that entomologists generally will favor the above procedure.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE APPLE LEAF-CRUMPLER AS A PEST OF COTONEASTER.

BY HARRY B. WEISS,
New Brunswick, N. J.

For the past several years this widely distributed species *Mineola indiginella* Zell.¹ which normally feeds on apple, quince, plum, cherry, peach and pear and which is rarely troublesome in well-kept orchards, has been noted as attacking various species of *Cotoneaster*, notably *microphylla* and *horizontalis* in a nursery at Rutherford, N.J. The *Cotoneasters* are ornamental shrubs, many of them having decorative fruits which remain usually through the entire winter. Some are adapted for rockeries on account of their low spreading or prostrate habit. They belong to the *Roseaceae* along with the apple, peach, etc.

The habits of the insect on *Cotoneaster* are practically identical with those noted on apple. The partly grown reddish brown caterpillars hibernate in a dark colored, elongate, crooked or twisted tube which is sometimes horn-like or cornucopia shaped. These tubes, which are about an inch in length, wide at one end and tapering to a point, are fastened securely to a twig for their entire lengths and are closed at both ends. Sometimes a tube will partly encircle a twig. Many tubes will be found where the branches fork. Each is lined inside with silk and covered outside with particles of leaves, etc.

In the spring the larvæ open the large ends of their cases and web up the foliage somewhat in the vicinity of the cases, later feeding on the leaves, flower buds, etc. Many of them feed on the green bark at the mouths of the cases and sometimes girdle the twigs. This twig eating habit was noted for the first time by Saunders² in connection with injury to fruit trees. As the larva grows

1. Identified by Mr. Carl Heinrich.

it enlarges its case by building additions to the wide end which is always open. The larva becomes full grown about the first or second week of June, loosely closes the opening of its tube with particles of leaves and silk and transforms to a reddish-brown pupa, which stage lasts about two weeks after which the moth appears. There is only one brood annually and eggs deposited during July result in overwintering larva. Most of the larval feeding appears to take place during the night, the larvæ remaining in their tubes during the daytime.

The adult was described by Zeller in 1848 under the name *Myelois indiginella*, the habitat being given as North America. The first reference to it in American literature appeared in 1851 in the *Prairie Farmer*. After this date later notices appeared in the *Prairie Farmer* and other publications. In 1889 Forbes² gave an account of the species and a good review of the literature up to that time. Stedman³ and Slingerland and Crosby⁴ state that in the spring, the larvæ cut the fastenings of their winter cases and travel with the cases to the opening buds on which they feed. Saunders⁵ states that when the caterpillars become active in the spring they leave the cases and draw the opening leaves near so that their meals can be enjoyed in safety. He mentions nothing about the case being carried about. On *Cotoneaster* the overwintering cases or tubes are securely fastened to the twigs for their entire lengths and in the spring the larva feeds on the foliage and twig bark in the immediate neighborhood of the case. Many specimens were examined but not one was observed carrying its case around. It was noted that larvæ which were removed from their cases and placed on foliage away from their homes, constructed new cases in the course of a day or so.

As only a brief description of the larva was given by Forbes⁷, the following is included:—

Full grown larva. Length about 13 mm. Width about 2 mm. Brown or greenish, subcylindrical, tapering slightly posteriorly. Head and cervical shield dark reddish-brown. Head broad, almost as wide as thorax, strongly shagreened, thoracic shield somewhat less so. Ocelli lateral, six in each group, five arranged in a semicircle and one below close to the antenna. Antenna three jointed, penultimate joint dark brown, ultimate joint minute. Thoracic shield occupying the greater part of the dorsal surface of the prothorax and bisected by a pale brown median line, at the end of the shield on each side is a dark brown, irregular area separated from the shield by a light brown line and extending almost the length of the shield; posterior to this area is a dark oval area enclosing the spiracle. Dorsal surfaces of thoracic segments two and three transversely wrinkled, the former bearing an irregular oval dark spot on either side of the middle, each spot containing a small spot from which arises a long white hair. Abdominal segments faintly transversely wrinkled. Dorsal plate of last segment slightly darker than body. Legs and prolegs of moderate size, legs reddish brown, sparsely hairy, hairs comparatively short and white. Head bearing several long,

2. Can. Ent. July, 1870, vol. II, pp. 126-128.

3. Fourth Rept. State Ent. Ill., pp. 65-74, 1889.

4. Mo. Agric. Exp. Sta. Bul. 36, pp. 73-80, 1896.

5. Manual Fruit Insects, p. 68, 1914.

6. Insects Injurious to Fruits, pp. 93-95, 1904.

7. Loc. cit.

fine hairs, each body segment bears comparatively long, fine hairs arranged more or less transversely, one row on each thoracic segment and two rows on each abdominal segment. All hairs arising from dark tuberculate bases.

The younger larva are more uniformly dark reddish brown and the body tapers more strongly from the second thoracic segment which gives the head and first segment an unusually wide appearance. At Rutherford, N. J., the larva was parasitized to some extent by *Tachina phycitae* Le Baron. Considerable damage can be done to *Cotoneaster* by the apple leaf-crumpler, especially by reason of its twig feeding habit. Where several are present on a twig, it is soon girdled. Moreover the leaves are small and the branches soon stripped. Arsenicals applied early in the season as in the case of infested apple trees should prove effective.

A NEW ANISOTA SPECIES FROM MANITOBA (LEPID.)

BY J. MCDUNNOUGH, PH.D.*

Entomological Branch, Ottawa.

Anisota manitobensis sp. nov.

♂.—Head, thorax, legs and abdomen a deep orange-brown; primaries somewhat deeper in color than thorax, prominently suffused in basal and terminal areas and at times along inner margin with purplish; the usual round, white discocellular spot; an oblique smoky line from apex of wing to inner margin 2/3 from base; secondaries less triangular than in *senatoria* and much less produced than in *virginiensis*, similar in color to primaries; terminal area suffused with purplish and defined inwardly by an oblique, rather broad, smoky line. Beneath much as above, rather bright in color. Expanse, 31-48 mm.

♀.—Wings paler than in ♂ sex with less purplish suffusion and with smoky subterminal lines broader, less sharply defined and shaded with purple.

Expanse, 55 mm.

Holotype.—1 ♂, Aweme, Man. (July 4th, N. Criddle) in Canadian National Collection.

Allotype.—1 ♀, Aweme, Man. (June 23rd, N. Criddle) in same Collection.

Paratypes.—2 ♂'s, Aweme, Man. (June 29th, July 4th, N. Criddle) in same Collection.

The species agrees with *stigma* Fabr. in the lack of any hyaline area on the primaries of the male; it differs, however, from this species in the entire lack of any brown sprinkling and the brighter coloration, approaching in this respect nearer to the females of *virginiensis* Dru. The males before me vary considerably in size. The species has also been captured, I believe, in the neighborhood of Winnipeg.

A CORRECTION.

On page 69, line 2, read "8 p.m." instead of "6 p.m."

* Contribution from Entomological Branch, Department of Agr., Ottawa.

SYNOPSIS OF SOME NORTH AMERICAN
ANTHOMYIINAE (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

Herewith are presented synopses of genera of Anthomyiinae to facilitate the identification of some of the species which I have recently described in this subfamily.

Eremomyoides Malloch.

This genus is distinguished from its allies by having hairs on prosternum, propleura in centre, pteropleura, and hypopleura.

KEYS TO SPECIES.

MALES.

- 1. Eyes separated by more than twice the width across posterior ocelli; fore tibia with 1 posterior bristle; costal setulae distinctly longer than diameter of costal vein; hind tibia with one or two bristles on anterior surface; apex of second antennal segment on inner side transverse; fifth sternite with a number of erect setulose hairs on apical half of inner margin of each process, the basal half bare.....*setosa* Stein
Eyes separated by less than twice the width across posterior ocelli; fore tibia normally with two posterior bristles.....2
- 2. Eyes separated by less than width across posterior ocelli; hind tibia reddish; costal setulae weak; second antennal segment almost transverse on inner side at apex; fifth sternite with very short hairs on entire length of inner sides of processes.....*cylindrica* Stein
Eyes separated by at least as great a distance as width across posterior ocelli; hind tibia black.....3
- 3. Costal setulae weak, hardly distinguishable from the costal hairs; hind tibia without an anterior bristle; thorax with three pairs of presutural acrostichals; second antennal segment angulated at apex on inner side.....*fuscipes* Malloch
Costal setulae strong, outstanding; hind tibia with an anterior bristle; thorax with two pairs of presutural acrostichals; second antennal segment transverse at apex on inner side.....*similis* Malloch

FEMALES.

- 1. Fourth abdominal tergite obtusely rounded apically, curved over apex of abdomen and armed with long, dense bristles, appearing tufted*parkeri* Malloch
Fourth abdominal tergite normal, not curved over apex of abdomen nor tufted, with a few bristles at apex.....2
- 3. Costal setulae weak, but little stronger than the costal hairs, and not longer than diameter of costal vein; mid tibia with an anteroventral and an anterodorsal bristle; apex of second antennal segment angulate at centre on inner side.....*fuscipes* Malloch

Costal setulae strong, longer than diameter of costal vein; mid tibia with an anterior bristle in addition to the other two; second antennal segment transverse at apex on inner side.....4

4. Hind tibia black; second segment of fore tarsus less than three times as long as its width at apex, third and fourth segments very much widened*similis* Malloch

Hind tibia rufous; second segment of fore tarsus at least four times as long as its width at apex, third and fourth segments but little widened*setosa* Stein

Anthomyia Meigen.

KEY TO SPECIES.

1. Deep black species, without conspicuous markings.....*aestiva* Meigen
Black species with dense pale gray pruinescence and deep black markings on thorax and abdomen.....*pluvialis* Linné

Egle Robineau-Desvoidy

Only one species, *mystacea* Coquillett, lacks the distinctive bristle on the anteroventral surface of the mid tibia in the male. The bristle referred to is found in both sexes. Meigen's species, *aestiva*, does not belong to this genus but to *Anthomyia*, the propleura being hairy. The species occurs in Newfoundland and Labrador.

KEY TO SPECIES.

1. Mid tibia without an anteroventral bristle; hind tibia with about 9 anterodorsal and 6 posterodorsal bristles, 3 of the latter short.....*mystacea* Coquillett
Mid tibia with an anteroventral bristle near middle.....2

2. Abdomen cylindrical, pale gray pruinescent, with a series of black dorso-central spots; hind femur usually with 4 widely spaced anteroventral, bristles on apical half; hind tibia with 1 anteroventral, 2 anterodorsal and 2 posterodorsal bristles.....*cinerella* Fabricius

Abdomen depressed, black, slightly pruinescent on each side of median line on dorsum so that when seen from behind each segment has a black vitta which is connected with an anterior transverse band and usually also with one on posterior margin.....3

3. Hind tibia with from 13 to 15 closely placed setulae on anterodorsal surface*hirta* Malloch

Hind tibia with from 5 to 8 bristles of irregular lengths on anterodorsal surface.....*radicum* Linné

Of the four species here listed *radicum* and *cinerella* are of general distribution and common to Europe and North America. The other two occur in the Western States at high altitudes and *mystacea* also in the extreme northwest.

Hammomyia Rondani

Generic characters: Head more or less buccate, parafacial in profile at least as wide as third antennal segment; distance between vibrissae not greater than distance of either from nearest eye-margin; abdomen in both sexes cylindrical or subcylindrical; female genitalia usually with two or more strong curved apical spines; hind tibia with at least three antero- and posterodorsal bristles; wing-veins 3 and 4 convergent apically; frons of female always less than one-third of the head-width, with or without interfrontal bristles.

KEY TO SPECIES.

1. Legs entirely black, or only the knees reddish; arista with very short hairs, the longest not as long as its basal diameter.....2
 Legs with at least the tibiae entirely or in large part reddish; arista with its longest hairs longer than its basal diameter; prealar bristle absent....3

2. Prealar bristle absent; mid tibia without a ventral bristle beyond middle; abdomen with a series of dorsocentral brown spots and a brown spot at each anterior angle of each tergite.....*maculata* Stein

Prealar bristle present; mid tibia in both sexes with one or two ventral bristles beyond middle; abdomen with a dorsocentral black vitta*paludis* Johannsen

3. Abdomen with a slightly interrupted central vitta and a large brown spot on lateral margin of each tergite; cross-veins of wings slightly infuscated, the outer one nearly vertical, its upper extremity very noticeably further from wing margin than its lower; female with a ventral bristle on mid tibia.....*johnsoni* Stein

Abdomen with a complete dorsocentral vitta and a poorly defined area on anterior lateral angle of each tergite fuscous; cross-veins not infuscated, outer one oblique, its upper extremity not much further from wing margin than its lower.....*marylandica* Malloch

Pogonomyza Schnabl and Dzeidzki.

The species of this genus have the legs entirely black; proboscis very much thickened, as thick as or thicker than the fore femora; the hind tibia with more than two posterodorsal and anterodorsal bristles, and in male without a fringe of fine hairs and without a blunt posterior spine at apex of fore tibia.

All the species are northern in their distribution. One species, *flavipennis*, occurs commonly in Europe in the fall on flowers of knapweed, thistles, and ragweed, and is found in New England and eastern Canada. There are some North American species still undescribed. The larval habits are unknown to me.

KEY TO SPECIES.

1. Hairs of arista very long, much longer than width of third antennal segment; prealar bristle very short.....*flavipennis* Fallen
 Hairs of arista very short, not longer than its basal diameter.....2

- 2 Mid femur with a number of strong bristles on apical half of anteroventral surface and two very long strong ones on basal half of posteroventral, the femora slender.....*spinosissima* Malloch
- Mid femur without bristles on apical half of anteroventral surface, the bristles on basal half of posteroventral surface very short; femora noticeably thickened.....*proboscidalis* Malloch

NEW SPECIES AND LIFE HISTORIES IN PAPAIPEMA SM.
(LEPIDOPTERA) NO. 20.

BY HENRY BIRD,
Rye, N. Y.

Papaipema insulidens Bird.

Although several occurrences of this species have been chronicled since its description in 1902, it remained for the fuller biological details to be detected by Mr. F. M. Jones, of Wilmington, Del., whose western trip in 1918 produced a number of interesting results. Mr. Jones' familiarity with the larval procedure in this genus made his observations particularly valuable, but excepting this one, he reported that no other symptom of *Papaipema* work came to his notice. On August 12th, while at Sisson, California, not far from the base of Mount Shasta, an unfamiliar plant attracted his attention, and an examination proved it to be bored by some larval form of this genus. Specimens of the plant and its contained insect were forwarded to the writer, the plant ultimately being determined by Dr. N. L. Britton, of New York, as *Senecio hydrophilus* Nutt. Of the ecological situation involved, Mr. Jones writes: "Larvae sent to you inhabited a tall, coarse herb, growing very locally, in an open and wet locality—almost out of the water. The flowers were bright yellow and conspicuous, the stems hollow and rather tender. The larva enters the stem and prepares an exit thinly ciled by papery epidermis of the stem, to, or below the ground surface, throws out little, or no frass, pupates low in the stem and prepares an exit thinly ciled by papery epidermis of the stem. At the date found, all but two had pupated (except those killed by parasites), and one of these was about to do so."

Of the twelve pupae forwarded, nine produced adults, with three falling to the usual predatory forces that follow in the wake of *Papaipema*. This mortality is of the average, after pupal change, and in a way, helps to strengthen the assumption that these larvae were doubtless following their usual trend in a preferred and primitive foodplant. Dr. Britton informs us that this section of the large genus *Senecio* has a number of closely allied species, and there is a possibility *insulidens* may take up with others also. Originally described from Vancouver Island, its range is thus extended considerably southward, and it may be assumed to follow the main habitat of the *Senecio* species serving as foodplant.

The larva seems typical of the generic series; head has the usual oblique line at the ocelli which finds a continuation in a lateral border to the cephalic

shield. The tubercles are not strongly defined, the anal plate of usual prominence, brownish, not black. The alcoholic specimen received is discolored from bacterial disease apparently, and details are indistinct. The pupa is normal, glossy and thin-shelled, so that the stigmata, though not brightly white, may be seen before emergence. It is supported in the hollow stem on a cushion of chewed fragments, at a varying distance below the exit orifice. Emergence of adults, Aug. 26 to Sept. 2. Three moths of the series have the stigmata suppressed, in the line of this frequent variation in the genus.

Papaipema nebris Gn.

The economic features connected with the introduction of the European Corn Borer, *Pyrausta nubilalis* Hub., have drawn much attention to the larval habit of *nebris* when it occasionally damages corn; because of both species being borers, the public frequently assumes to have met the former, whereas it is generally the indigenous species which is concerned. While many of its congeners will, in the first stages, attack grasses, *nebris* seems to be the only one that takes up with, and completes its transformations in corn. These attacks are simply invasions, since the females of the preceding year could not anticipate the following year's location of corn, and it is noticeable also that it is always the borders of plantings which show damage. The entry of the larva is by descent into the head of the leaf whorl, and though the plant continues to grow, the embryonic flower head is destroyed and no ears ever mature.

The Ambrosiaceae were presumably primitively preferred foodplants with this species; some of these plants, particularly *Ambrosia trifida*, are apt to occur as weeds at the borders of cultivation, and due to such occurrence, when oviposition may have been numerous at such points, the unplaced larvae of the following season have to shift to whatever may avail them. The point that we wish to emphasize is that whereas *nebris* normally furnishes an astonishing panorama of parasitism, when working in the preferred Ambrosiaceae, when in corn our observations show an almost entire absence of parasitic attack. The same holds with regard to its accidental presence in any cultivated plant and indicates that it is much to the advantage of the species to make these occasional detours. So keen are its enemies—*Macicera senilis*, Mg., and *Microplitis gortynae* Riley, (det. A. B. Gahan), being of chief import in the East—in ferreting out their host that at times total extinction in limited locations result. The parasitized larvæ offer, in the case of *Microplitis* particularly, a fruitful field to a secondary following which is numerous in point of species, and efficient in its aid to the central host. There is thus a swinging pendulum of events, registering a rise as *nebris* gains an ascendancy, which may be maintained for several years, then an abrupt fall when the primary foes have gained their advantage. From this we may gather that, with the adaptability of *nebris* to so many plants of cultivation, its adventitious establishment in suitable foreign conditions would doubtless bring it into prominence as a first-class pest.

An adult *Papaipema*, undertermined and so far unencountered as a larva, has stood in our series for many years. It was a capture at light and seems to represent an individuality that is not yet recorded. The following name is proposed for it:

Papaipema placida n. sp.

Head smooth on frons, antenna simple, ringed at base by white scales. The thoracic vestiture is normal in tuftings and density, dull yellowish intermixed with purple-brown; abdomen paler, lustrous luteous. Fore wing in outline rather more falcate below apex than usual; basal area defined in the dull yellow ground color, basal line double; median field evenly defined in dull yellow except above median vein inward from reniform, where a powdering of purple brown occurs; the orbicular and claviform show as three superimposed white spots, the middle one being a mere dot; the reniform is broken into dots by the veins, clustered about the central lunulate line, and all pure white except the middle outer one, which is yellow; the median shade line is prominently marked in brown from reniform to inner margin; post-medial line is double and bends outward with pronounced sweep past reniform; subterminal area dull purplish; terminal space scarcely differentiated in paler shade; the usual apical dash is of the ground colour. Hind wing much paler, of a luteous shade of the ground color of fore wing, with the veins, a discoidal spot, a median line and a subterminal band marked in brown powderings. On the under surface the wings are glistening luteous, a median line observable and brown powderings which are deepest at the costal margins.

Expanse 31 mm.

The male genitalic structure is of the conventional pattern of the genus. In minor degree, a narrowing of the valva immediately behind the costa is noteworthy in being more pronounced than with any other species. The usual curved, and sharp-pointed harpe has its outward edge finely toothed. The unique male type is with the writer and was taken at New Brighton, Pa., (F. A. Merrick), September 6, 1907. This single example is in good condition, and unless a dwarf, indicates a small species of a coloration similar to *duovata*, or to occasional specimens of *harrisii*. From the latter and from *astuta*, it differs in the greater curve of the post-medial line.

NOTES ON A COLLECTION OF LABRADOR LEPIDOPTERA.

BY J. MCDUNNOUGH, PH. D.*

Entomological Branch, Ottawa.

Through the kindness of Dr. E. M. Walker, of Toronto, a very interesting lot of Labrador Lepidoptera, collected in the vicinity of Hopedale, and a much smaller lot, taken at Nain, has passed through my hands for identification. Due to the long series of several species I have been enabled to clear up some doubtful points of synonymy and append herewith a list of the species collected with notes on certain of them. Where no definite locality is mentioned it is understood that the species were captured at Hopedale.

PIERIDAE.

Pieris napi frigida Scud.

I have already on two occasions discussed the status of this race (B. & McD., Contrib. III, 58, Pl. VII, figs. 1, 2; IV, 63). With a long series of

* Contribution from Entomological Branch, Department of Agr., Ottawa.

both sexes before me, captured July 7-18, it is evident that Scudder's diagnosis was based entirely on specimens of the female sex, and rather worn specimens at that. This accounts for his statement that the "secondaries of the male *frigida* are shaped as in the ♀ of *oleracea*" and that "the black scales above at the base of both wings are more profuse and widely spread." *Borealis* Grt. based on ♂ specimens will sink as a synonym.

The underside of secondaries varies in color from quite pale to strikingly bright yellow (especially marked in ♀'s) and in all cases the veins are very heavily outlined in black. On the upper side the ♂'s are pure white with the veins in the apical area marked with black; the ♀'s have at times a marked yellow tinge, are heavily sprinkled with smoky scales on primaries at base of wing and along inner margin and in well marked specimens show traces of the two subterminal spots; the veins are more suffused with black than in the ♂ sex. *Frigida* Scud. will represent the race from Labrador, Newfoundland and adjacent areas in Quebec with the partial summer generation *acadica* Edw. in Southern Newfoundland. The figures given in the "Contributions" (1. c. Pl. VII, figs. 1, 2) represent well-marked specimens of this race.

Eurymus pelidne labradorensis Scud.

The species was represented by a long series of rather indifferent specimens. I have treated of it in "Contributions III, 67, Pl. VII, figs. 6-8." Greenland and Iceland specimens must be examined before it can be determined whether the racial name is valid or should be sunk as a synonym.

Eurymus nastes Bdv.

Two specimens, Nain.

NYMPHALIDAE.

Brenthis apherape tricularis Hbn.

Brenthis chariclea boisduvali Dup.

Both the above well-known Labrador forms were represented by good series.

Brenthis freija Thun.

A single worn specimen, taken July 26th.

Brenthis polaris Bdv.

One ♂ captured August 5th.

SATYRIDAE.

Oeneis jutta Hbn.

A worn ♂, captured on August 2nd at Hopedale; another ♂ from Nain.

Oeneis taygete Hbn.

Several good specimens of both sexes captured between July 25th and August 23rd.

Oeneis oeno Bdv.

A small series of both sexes was present.

My idea of this species was given in "Contributions IV, 68" and I still adhere to this opinion. Besides the Labrador specimens several from the north shore of the Gulf of St. Lawrence are before me, captured by C. H. Young at Rocky Bay; these cannot be separated from the Labrador specimens

in maculation but in the ♂ genitalia show slight divergences and are the exact counterpart of the figure of the genitalia of *katahdin* given in "Contributions Pl. XXX, fig. 1." Under these circumstances it would appear that *katahdin* should be considered as a geographical race of *oeno* and not as a good species. I give figures of the genitalia of the Labrador and Gulf Coast forms, the main point of distinction is found in the width of the valves at their distal end.

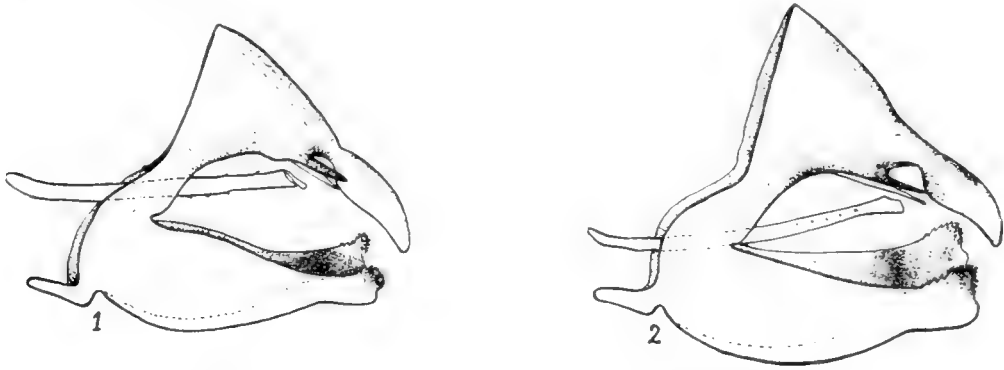


Fig. 1. Male Genitalia of *Oeneis oeno* Bdv. from Labrador:

Fig. 2. Male Genitalia of *Oeneis oeno* Bdv. from Rocky Bay.

LYCAENIDAE.

Plebeius scudleri Edw.

As far as I know this species has not been captured in Labrador since it was recorded by Moeschler (1873, Stett. Ent. Zeitschr. 155). A small series of both sexes, taken in August, was present and the specimens are quite typical, the male showing scarcely any traces of the red submarginal lunules on the underside of primaries; the ♀ is heavily shaded with blue on the upper side without or with mere traces of orange lunules above the black submarginal spots of secondaries.

Plebeius aquilo Bdv.

This well-known Arctic form was represented by a few worn specimens.

Heodes dorcas Kby.

A single ♀, captured August 15th, very closely resembles Kirby's figure in the Fauna Boreali-Americana. I am not aware that the species has been recorded from Labrador but the record is not surprising as the species is a distinctly northern one.

Hesperia centaureae Ramb.

AGARISTIDAE.

Androloma mac-cullochi Kby.

Two specimens, taken July 14th and August 23rd.

NOCTUIDAE.

Epipsilia okakensis Pack.

Only a single pair of the species from Hopedale was present which is rather surprising as it is one of the commonest species in the region; a small series occurred in the lot from Nain.

Epipsilia quadrangula Zett.

A good series, illustrating the variability of the species in regard to the depth of maculation and the intensity of the black areas around the reniform and orbicular.

Anomogyna sincera H. S.

A single specimen without date of capture. The species has been recorded from Labrador on the authority of Moeschler, but this is the first authentic specimen which has passed through my hands. It agrees well with the figure in Spuler, Schmett. Europas. Pl. XXXIII, fig. 1.

Anarta richardsoni Curt.

One ♀, captured July 18th, Hopedale; several specimens from Nain.

Polia pulverulenta Sm.

One ♀, captured August 6th. The record is a new one although not surprising as the type specimens were taken at Orono, Me., where so many northern forms have been located. Figures of the species will be found in the Barnes & McDunnough Contributions, Vol. IV, Pl. XVI, figs. 2, 3.

Sympistis melaleuca Thun.

A good series was present: there is considerable variation in the amount of black suffusion on the primaries.

Trichoplexia exornata Moesch.

One ♀, captured August 5th.

Eremobia maillardi exulis Lef.

Two ♂'s and one ♀ of this variable species were included in the Hopedale lot; they all belong to the form without white streaks on the veins. One specimen from Nain was also present.

Hyppa xylinoides Gn.

One ♂, taken July 18th, seems best referred to this species although the color is rather darker and the white patch above the anal angle reduced to a narrow line. More material will be necessary to determine whether we are dealing with a racial form or not.

Autographa arctica Moesch.

Of late years a few stray specimens of this species have passed through my hands; the present collection contains a long series, however, which conclusively shows that *arctica* from Labrador and *vaccinii* Hy. Edw. from Mt. Washington, N. H., are specifically identical. Both show the same finely waved t.p. line and vary similarly in the amount of black suffusion on the central portion of primaries.

Arctica was originally treated as a Labrador race of *u-aureum* Gn., described with type locality, Dalecarlia. Aurivillius, in his paper on the Insects of Greenland (1890, Bihang K. Sv. Vet. Akad. Handl. XV. Afd. IV, p. 16), makes it a pure synonym of *u-aureum* along with *groenlandica* Staud. and figures the species on Pl. 1, fig. 7. This figure corresponds remarkably closely to our Labrador specimens. Hampson (1913, Cat. Lep. Phal. Brit. Mus. XIII, 424, 432) separates *u-aureum* Gn. and *groenlandica* Staud., making *vaccinii* Hy. Edw. a synonym of the former and figuring the species (Pl. 236, fig. 16) from a North American specimen. Under *groenlandica* he cites *arctica* Moesch. and *u-aureum* Auriv. (nec Gn.). His figure of *groenlandica* (Pl. 236, fig. 23), drawn from an Iceland specimen, certainly appears to represent a species distinct from his other figure but does not agree with Aurivillius' figure above mentioned either in the shape of the gamma-mark or the wavy nature of the t.p. line. Further under *u-aureum* he cites no European localities for the

species and is followed in this by Warren in Seitz, Macrolep. Palaearc. Noct. who makes no mention of *u-aureum* as being Palaearctic. It would almost seem as if European lepidopterists had agreed that the locality 'Dalecarlia,' given by Guenée was erroneous and that the name *u-aureum* was based on Greenland or Iceland specimens; I have seen, however, no published notice to this effect.

Ottolengui (1917, Ent. News XXVIII, 29) treats of *vaccinii* and its synonymy but makes no mention of *arctica* Moesch.

The identity of *u-aureum* and *groenlandica* being in doubt I am obliged to leave them out of consideration for the present; if Aurivillius be correct Guenée's name will take priority; in the meantime the species should be known as *arctica* Moesch. with *vaccinii* Hy. Edw. as a subspecies of doubtful value from New Hampshire and possibly adjacent mountain peaks.

Syngrapha diasema borea Auriv.

A single ♀ specimen corresponds excellently well with Aurivillius' description and figure (op. cit. 17, Pl. 1, fig. 8); this race is said to differ from the type form from Northern Europe in the distinctly yellow coloration of the central area of secondaries with moderately broad smoky border. I have always been inclined to associate a form found in the Rocky Mountains of Canada with *borea*; this same form has recently been treated as a new species by Dr. Ottolengui (1919, Jour. N. Y. Ent. Soc. XXVII, 121, Pl. XV, fig. 2) under the name *diversigna*. With a Paratype and a series of five males from Nordegg, Alberta, before me, I have made a careful comparison with the Labrador specimen and fail to find any characters which would warrant specific distinction; the Alberta specimens are slightly smaller and the yellow of secondaries somewhat brighter and if desired the name *diversigna* Ottol. may be retained to designate the Rocky Mountain race; for the Labrador and Arctic race which is certainly easily separated from *diasema* by the color of the secondaries Aurivillius' term *borea* should be used and the synonymy would thus stand.

diasema Bdv. N. Europe.

(a) *borea* Auriv. Greenland, Labrador.

(b) *diversigna* Ottol. Canadian Rocky Mountains.

LYMANTRIIDAE.

Gynaephora rossi Curt.

One pair of this well-known Arctic form.

GEOMETRIDAE.

Acidalia frigidaria Moesch.

A series of this well-known form captured July 12th-20th shows considerable variation in the distinction of the transverse lines which at times become almost lost in the general gray ground-color.

Carsia paludata labradoriata Moesch.

One specimen.

Dysstroma citrata Linn.

A couple of rather worn specimens taken 23rd August. These were of the dull gray form with slight ruddy subterminal suffusion and with median band rather paler than the remainder of the wing, due to less heavy sprinkling of gray scales. This appears to be the usual form in northern localities.

Xanthorhoe designata Hufn. . .

A small series, rather worn, captured between July 25th and August 6th.

Xanthorhoe algidata Moesch.

The identity of this species has always been doubtful; the general conception, following a specimen in the British Museum, is that it is a species closely allied to *fossoria* Tayl. A single ♂ before me fits these requirements although not agreeing very closely with the original description as regards the details of the median band. For the present I identify it tentatively as *algidata*. The genitalia seem distinct from those of the other members of the group as far as I can judge from Swett's paper (1918, Can. Ent. L, 17) with little or no material before me for comparison. The costa is narrow apically and bears a bunch of long spines directed inward.

Xanthorhoe ferrugata Clerck.

A number of specimens captured in July and considerably the worse for wear.

Euphyia luctuata obductata Moesch.

Apparently one of the commonest geometers of this region; some specimens show traces of a narrow pale band on secondaries.

Eulype hastata Linn.

One specimen, taken August 5th, of the typical form.

Dasyuris polata Dup.

Two ♀'s, captured August 21st and 22nd.

Eupithecia sp.

Several specimens too worn for identification.

Macaria granitata sexmaculata Pack.

Four specimens which presumably may be referred to this race.

Aspilates orciferaria labradoriata Moesch.

A good series, the ♀'s showing a decided yellowish tinge to the primaries

PYRALIDAE.

Nomophila noctuella Schiff.

Two specimens taken early in August.

Scoparia centuriella Schiff.

A number of small, rather dark specimens.

Laodamia fusca Haw.

One male.

Platyptilia carduidactyla Riley.

Two specimens of this species, kindly identified for me by Dr. A. Lindsey; the species has to my knowledge not been previously recorded from Labrador.

GELECHIIDAE.

Gelechia continuella Zell.

One specimen. This European species has been twice described from North America under the names *trimaculella* Pack. and *albamaculella* Cham. Mr. A. Busck informs me that he has recently made slides of the ♂ genitalia of specimens from both continents and they prove to be identical, establishing the above synonymy.

TORTRICIDAE.

Olethreutes intermistana Clem.

Three specimens; kindly identified by Mr. A. Busck of the U. S. National Museum.

Tortrix moeschleriana Wocke.

Two specimens.

Cnephasia osseana Scop.

Three specimens; identified by Mr. A. Busck.

TINEIDAE.

Monopis biflavimaculcella Clem.

Four specimens.

CRAGIN'S COLLECTION OF KANSAS MYRIAPODA.

BY HORACE GUNTHORP,

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The first Myriapod record for the State of Kansas is that of Wood (8, pg. 11)¹, who reported the single form *Scolopendra polymorpha* from Fort Riley, Kansas, in 1861. This constituted the sole record for the state until 1885, when Meinert (7, pg. 196) reported *Scolopendra heros* from Riley, Kans. As he considered *S. polymorpha* a synonym of *S. heros*, forms now known to be distinct, he was undoubtedly dealing with the former, as there is no authentic record of *S. heros* occurring as far north in Kansas as Fort Riley, so he cannot be said to have added a new name to the state list. The same year W. F. Cragin (5) published a short list of Kansas Myriapoda in which he enumerated twelve forms covering some nine species in seven genera. In 1893, Bollman (2, pg. 183) placed *Parajulus venustus* on the Kansas list.

No new forms were added until 1913, when the present writer published a more extended catalogue, covering more extensive collecting over the state. This latest list included a total of fourteen species of Diplopoda and fifteen of Chilopoda.

At the time of publishing this last mentioned paper, an effort was made to examine the collection evidently made by Professor Cragin, with the result therein recorded (6, pg. 168) which was as follows: "Through the kindness of Prof. C. H. Edmundson, of Washburn College, I have examined two individuals of this species (*Scolopendra heros*) collected by Cragin in Barber County. The larger one measures 140 m. These two specimens are all that remain of Prof. Cragin's Myriapoda collection, as the remainder were destroyed by fire." This fire occurred in 1908.

During the past year, while the writer was rearranging the specimens in the museum at Washburn College, a perforated board holding some fifty bottles of specimens came to light, some of which, upon examination, proved to be part of the Myriapoda collected by Cragin. This led to a systematic search of the laboratories and store rooms, with the result that a total of twenty bottles plus one dried, pinned specimen were found. With the exception of the latter, there is little doubt but that they are all from one original collection, in

¹Numbers in parenthesis refer to bibliography at end.

spite of the fact that some of them unfortunately have no labels. This gave the writer a chance to check Cragin's published list with probably most of the material originally used by him, and revise the list of Kansas Myriapoda, with the results recorded below. The collections will be deposited in the Museum of the University of Kansas.

DIPLOPODA.

Fontaria virginienſis (Drury).

Cragin reports "Two specimens from Kansas Valley Woods, Shawnee Co." There are two bottles of this species in the collection. One contains two specimens, and is labeled "*Polydesmus virginienſis* (Drury), Topeka, Cragin." The other contains one specimen from "Baxter Springs, Ks., Dr. J. M. Duncan." As Topeka is in Shawnee County, it is evident the first bottle contains the specimens referred to by Cragin.

Leptodesmus placidus (Wood).

Cragin records, under the name *Polydesmus floridus*, three specimens from near Thompsonville, Jefferson Co. None in the collection.

Polydesmus pinctorum Bollman.

Cragin does not record this form, but there are five male specimens in the collection labelled "Topeka, Cragin."

Polydesmus serratus Say.

Cragin does not mention this, but there are three specimens, without labels in the collection.

Lysiopetalum lactarium (Say).

Cragin does not record this, but there is one specimen in the collection labelled "Topeka, Cragin."

Arctobolus marginatus (Say).

Not recorded by Cragin, but there are nine specimens in the collection, all without labels except one, which is from "Topeka, Ks., L. A. Whitney." Seven of these are without heads!

Tylobolus uncigerus (Wood).

Cragin reports this species under the name *Spirobolus uncigeris* from Shawnee County. As the writer has previously stated (6, pg. 164), other recorded localities for this species are restricted to California and Oregon. It is not to be found in the collection, which fact, taken together with its known distribution, leads to but one conclusion, i.e., it should be stricken from the list of forms in the state. From the mutilated condition of the above mentioned specimens of *A. marginatus* it is quite possible that their identification caused trouble and they were recorded as *uncigerus*.

Parajulus venustus (Wood).

Cragin says, "Specimens of *Iulus* are abundant in Shawnee Co., but I shall not be able to report upon any of them in the present contribution." (5, pg. 145). One specimen in the collection, labeled "*Iulus venustus*, Topeka, Cragin" appears to be this species.

CHILOPODA.

Scutigera forceps (Raf).

Recorded from Shawnee, Labette, and Barber Counties by Cragin. Seven specimens in collection, one from "Under old beam, Washburn Col., Topeka, May 9, 1884," and another from "Newton (Harvey Co.) Kans."

Lithobius forficatus (L.)

Not recorded by Cragin. One specimen, dried, in case with insects, labeled "Topeka." Probably not one of Cragin's collection.

Lithobius transmarinus (Koch).

Cragin reports this form from Barber Co. under the name *Neolithobius mordax*. One specimen in collection, in bottle containing no label.

Otocryptops sexspinosus (Say).

Not recorded by Cragin, although the present writer so stated in his report (6, pg. 167). Three specimens in collection, without label.

Scolopendra heros Girard.

Cragin reports this form under three varieties, *S. heros*, *S. heros*, var. *castaneiceps* Wood, and *S. heros*, var. nov. *prismatica*, the distinguishing characters of the latter being "The superior surface of each scutum, except the first and last, may be said to be bounded by three planes, one horizontal and two sloping from either of the same and making with it a clearly-cut angle, giving the appearance of a double bevel. The general color of the specimen in alcohol is deep purplish-black, in sharp contrast with the bright orange-brown of the head and first body segment; feet greenish-yellow, the last pair concolorous with the body, and a little stouter than in the typical species." (5, pg. 144). All of above forms he records from Barber Co. only.

There are five specimens of this species in the collection, all labeled "Barber Co., Cragin." One of these may be the type of Cragin's variety *prismatica*, as the back distinctly shows the three planes as described above, but the color has all faded to a yellowish-orange, and there is no special label to distinguish it from the other specimens. The head is distinctly that of *S. heros*, and so are the prosternal teeth. The pseudopleural processes bear five and seven spines. The prefemur of the anal legs bears eight and seven spines on the ventral surface, and five and six respectively on the inner surface. This variation in number of spines is probably due to the fact that one anal leg is smaller than the other, due to regeneration. The apical processes bear five and nine spines. While these numbers are slightly below the average, they can hardly be said to form grounds for the formation of a new variety, and the peculiarity of the back seems to be only a slight exaggeration of a condition found in other specimens of this species.

Scolopendra morsitans L.

Reported by Cragin from Barber Co. under the variety name *coerulescens*. His description follows: "A centipede with antennae 20-jointed, I refer here provisionally, though it differs in some respects from the characters given by Newport and Wood for this species, and though the latter author has expressed his belief that *S. morsitans* is not an inhabitant of the United States. The color is a uniform light blue, or greenish blue, pale, almost to translucent, the legs being nearly colorless and transparent. The mandibles are dark green,

in sharp contrast with the light-bluish hue of the mouth-parts, which are concolorous with the head and body. The entire animal is of a more delicate structure than is usually seen even in small specimens of the genus. The reflexed antennae cover about four segments of the body. The length is a little over an inch. These characters will suffice to distinguish this variety of *morsitans*, if I am right in referring it to that species; but I shall elsewhere give the details of its form and armature.

"Newport states that the range of *S. morsitans* includes the tropical and subtropical portions of the New World, and an unknown portion of China. In view of the many subtropical features in the fauna of Southern Kansas that have already come to light, the discovery of this species in that region need be hardly a matter of surprise. Our specimen was found under a stone on the summit of a high hill in Barber Co., about 500 feet above the Medicine River at Medicine Lodge."

Bollman (1, pg. 174) lists this variety as a synonym of *S. morsitans*, but states that it may not be such, as Cragin's "description is so indefinite that it is almost impossible to tell to what species it may belong." This record for the species has evidently been accepted by Chamberlin (3, pg. 479), as he says, "In the United States known from Georgia, Florida, Kansas, Utah, and California." It is probably best to let it stand until more extensive collecting in the southwestern part of the state has cleared the matter up. There is no specimen referable to this species in the collection, nor one which corresponds to Cragin's description.

Scolopendra polymorpha Wood.

Recorded from Rice, Finney and Barber Cos. by Cragin. There are three specimens in the collection, but with no labels.

A corrected list of the known Myriapoda occurring in Kansas at this writing would be as follows:—

DIPLOPODA.

Fontaria virginiensis (Drury); *Leptodesmus hispidipes* (Wood); *Leptodesmus placidus* (Wood); *Oxidus gracilis* (C. L. Koch); *Polydesmus pinetorum* Bollman; *Polydesmus serratus* Say; *Scytonotus granulatus* (Say); *Cleidogona* sp.; *Lysiapotalum lactarium* (Say); *Arctobolus marginatus* (Say); *Parajulus diversifrons* (Wood); *Parajulus impressus* (Say); *Parajulus venustus* (Wood).

CHILOPODA.

Scutigera forceps (Rafinesque); *Lithobius forficatus* (Linnaeus); *Lithobius transmarinus*. Koch; *Nadabius jowensis* (Meinert); *Tidabius kansensis* (Gunthorp)²; *Pokabius bilabiatus* (Wood)³; *Otocryptops sexspinosus* (Say); *Scolopendra heros* Girard; *Scolopendra morsitans* Linnaeus; *Scolopendra polymorpha* Wood; *Arenophilus bipuncticeps* (Wood); *Arenophilus osborni* Gunthorp; *Geophilus dolichocephalus* Gunthorp; *Geophilus mordax* Meinert; *Lino-taenia fulva* (Say).

²*Lithobius kansensis* Gunthorp. (6, pg. 166). This species should be placed in the genus *Tidabius* recently created by Chamberlin (4, pg. 80).

³*Lithobius bilabiatus* Wood. Proc. Phil. Acad., 1867, p. 130.

Poabius bilabiatus Chamberlin. Ann. Entom. Soc. Amer., 5: 153, 1912.

Pokabius bilabiatus Chamberlin, Canad. Entom. 44: 316, 1912.

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NOTES ON COCCIDAE VIII, (HEMIPTERA).

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A REVIEW OF MACGILLIVRAY'S "THE COCCIDAE."

(Continued from page 61).

The establishment of a separate subfamily for the peculiar genus *Apiomorpha* is perhaps justified, but I cannot agree with MacGillivray in assigning to the Apiomorphinae such forms as *Ascelis* and *Opisthoscelis*. The latter I suspect to be related to *Capulinia*, which MacGillivray refers to the Cylindrococcinae. As to the first named I have specimens but no opinions concerning them except that I cannot connect them with any of the other Coccidae.

The subfamily Cylindrococcinae is simply a heterogeneous assemblage of doubtful forms. I am unable to see any special connection between such genera as *Halimococcus*, *Phoenicococcus*, *Capulinia* and *Cylindrococcus*, of all of which I have specimens. But I must confess to a total lack of knowledge as to what should be done with them. MacGillivray has retained Brittin's genus *Scutare* in the Conchaspinae, yet Green, who has examined specimens, states that it does not belong in the group and refers the single included species to *Rhizococcus*. Judging from Brittin's figures and description I am inclined to agree with Green that it does not belong in the Conchaspinae. However, I believe the genus to be valid, although I cannot say where it belongs. Following Newstead MacGillivray records the presence of abdominal spiracles in this subfamily. Judging from preparations that are of the best I cannot agree that the structures in question are spiracles. There is no visible opening and the appearance is the same as that of the pair of ventral tubercles that appears for instance in *Kurvanina*.

The subfamily Disapidinae has been the special recipient of MacGillivray's attention and occupies 249 of the 465 pages of text in the book. Throughout this subfamily the storm of genus making has raged, reaching its climax in the Aspidiotini, and of the old genera there remain nothing but fragments. I count 116 new genera in the sub-family. To attempt to analyze these genera in anything short of another book is impossible and I shall content myself here with discussing only a few of the most remarkable results and some of the most obvious errors. Yet the commission of such errors as some of these are is sufficient to cast doubt upon the value of MacGillivray's conclusions in general. It is conclusive evidence that he has not attained to that knowledge and understanding of the group that should have preceded any such wholesale rearrangement as he has undertaken.

In the general discussion of this subfamily I note two errors that may be of some importance. On page 218 it is stated that in the first stage nymphs the distal segment of the antennae "is long and constricted and appears as if composed of several segments." This is true of only a part of the group, for in some species the distal segment is short and not at all annulated. On page 220 it is said that when the insects of the second stage molt "there is no variation in the way in which the cuticle ruptures." However, in some forms such as certain species of the genus *Odonaspis* (as previously understood), the ventral skin separates entirely from the dorsal and is incorporated in the ventral scale.

I am not entirely in accord with MacGillivray's arrangement of the tribes in this subfamily, although this is not original with him. I consider that the various groups of species in which the adult remains enclosed within the second exuvia are, with certain exceptions, derivatives of forms that are included in the various other tribes and that separate tribes for such groups as the Leucaspidini and Fioriniini tend merely to obscure their real relationships. Furthermore I consider the distinction between the tribes Lepidosaphini and Disapidini to be entirely artificial. The genus *Ancepaspis*, which MacGillivray attaches to the Aspidiotini I consider to represent an independent group.

In many cases throughout the subfamily MacGillivray has separated genera on the basis of the presence or absence of the paragenital pores, the "genaceros." That the consistent following of this practice results in artificial groups seems to me evident as for instance in the case of the genera *Lineaspis* and *Cupidaspis*, the types of which are scarcely separable specifically except for this difference. Such splitting as this may be convenient but it does not express the relationships of the forms involved.

The peculiar combinations obtained by MacGillivray's methods begin to appear in the tribe Parlatoriini where *Parlatoria chinensis* Marlatt and *P. pyri* Marlatt are referred to the genus *Cryptoparlatoria* with *C. leucaspis* Lindinger as type. If specimens before me as *C. leucaspis* be correctly determined such an arrangement is quite untenable.

In the Leucaspidini two such utterly different species as *L. indica* Marlatt and *L. kelloggi* Coleman are placed together in *Suturaspis*. The latter species, in fact, does not even belong in this group for the adult female is not enclosed within the exuvia of the preceding stage. Under the Lepidosaphini I have scarcely a large enough representation of the species to permit comments. I may note, however, that the genus *Anidomytilus* is retained as separate on the basis of the supposed absence of plates cephalad of the anal lobes—although these plates are present as I have shown in another paper. Also *Lepidosaphes mexicana* (Ckll.) which MacGillivray places in *Triaspidis*, really runs to *Leonardaspis* if it runs any place.

In the tribe Diaspidini the genus *Diaspis* is separated from *Cockerellaspis* and *Epideaspidis* by reason of its having the "Pygidium with caudal margin deeply concave on meson with median pair of lobes in concavity. .," yet *Diaspis calyptroides* Costa, the type of the genus, has not the slightest trace of such a character and *D. phoradendri* Ckll., which MacGillivray retains in *Diaspis* has the median lobes extremely prominent. *Diaspis toumeyi* Ckll., which is referred to *Pseudaulacaspidis* is a species of the same type as *D. texensis* Ckll. and *D. manzanitae* (Whitney) which are retained in *Diaspis*.

I am entirely unable to concur in the separation of *Essigaspidis*, with *Protodiaspidis agrifoliae* Essig as type, and *Obluctaspis*, with *P. lobata* Ferris as type, from *Protodiaspidis*. On the other hand MacGillivray has retained in *Protodiaspidis* the species *P. pulchra* Ferris which might well have been taken out. Furthermore he has left in this genus, where they certainly do not belong the two species *edentata* Ferris and *anomala* Green, while the genus *Ancepaspidis*, to which they do belong, has been transferred to the Aspidiotini! I consider that *Ancepaspidis* really represents a distinct group.

The two genera *Aulacaspidis* and *Phenacaspidis* are apparently closely related, at least in part, for some of the species referred to the latter genus, such as *P. mischocarpi* Ckll. and Rob., appear really to belong to the former. This fact appears entirely to have escaped MacGillivray's notice. It has long been apparent that the genus *Chionaspis* was in need of limitation. The process was begun by Cooley and has been continued by MacGillivray with none too fortunate results. Such peculiar forms as *C. etrusca* Leonardi and *C. spartinae* Comst. are retained in *Chionaspis* when they might well have been removed, while such a form as *C. caryae* Cooley which is really rather close to typical *Chionaspis* is taken out.

I believe that it has already been pointed out that *Hemichionaspis* is a synonym of *Pinnaspis*. Certainly if specimens in my hands determined by Cockerell as *P. buxi* be correctly named there is no doubt that it is. Yet MacGillivray places *Pinnaspis* in the Lepidosaphini and *Hemichionaspis* in the Diaspidini.

Chionaspis striata Newstead is made the type of the genus *Lineaspis* and *Leucaspis cupressi* Coleman the type of *Cupidaspis*, yet the two species differ only in the fact that the former possesses "genacerores" while the latter does not. I regard them as congeneric and for them the name *Lineaspis* will stand.

A new genus, *Situlaspis*, has been named for *Pseudodiaspis condaliae* Ferris, yet this species is no farther from the type of *Pseudodiaspis* than are the others that are retained in that genus.

In the tribe Aspidiotini there are before me specimens of *Furcaspis biformis* (Ckll.) which show that MacGillivray's conception of this genus is entirely distorted. He has excluded from this genus two species, *haematochroa* Ckll. and *oceanica* Lindinger, which seem really to belong to it and has referred them to the genus *Spinaspidotus* together with such a species as *Aspidiotus pangocensis* Doane and Ferris with which I can not believe that they have anything at all to do. Conversely he has referred to *Furcaspis* such species as *Aspidiotus jordani* Kuwana and *A. juglans-regiae* Comst.—a truly remarkable combination.

He has, I say, placed *Aspidiotus juglans-regiae* in *Furcaspis*, while under *Quadraspidotus* appear *A. glanduliferus* Ckll. and *A. fernaldi* Ckll, the former of which is certainly and the latter almost certainly a synonym of *juglans-regiae*.

The former *Targionia helianthi* (Parrott) appears as the type of *Rhisaspidotus*, *T. gutierreziae* (Ckll.) as the type of *Chorizaspidotus*, and *T. chenopodii* Marlatt as the type of *Remotaspidotus*—yet the three are scarcely separable specifically.

Under *Neosignoretia* appears *Aspidiotus yuccae* Ckll., which I have elsewhere referred to *Pseudodiaspis* and which is a Diaspidine form, and associated with it is *Aspidiotus yulupae* Bremner which I regard as a synonym of *A. osborni* Ckll. and Newell, the latter being placed under *Diaspidiotus*.

Targionia yuccarum (Ckll.) is made the type of a new genus, *Targaspidiotus*. I reaffirm my former opinion that it is a true *Targionia*. The species described by Marlatt as *Aonidia juniperi* (and which I believe to be a true *Aonidida*) is referred to *Targionia*, while *Aspidiotus shastae* Coleman, of which *juniperi* is a synonym, is referred to *Gonaspidotus* in company with such strange companions as *Aspidiotus graminellus* Ckll.

Xerophilaspis, referred by MacGillivray to the Aspidiotini, in my opinion belongs in the Diaspidini.

Under *Comstockiella* appears *Aspidiotus riverae* Ckll. which belongs somewhere in the Diaspidini.

Aspidiotus anonae Houser (which is a synonym of *A. herculeanus* Doane and Hadden) is made the type of the genus *Clavaspis*, while *A. subsimilis* Ckll. of which *anonae* was formerly regarded as a variety is referred to *Hendaspidiotus*. While I can not consider that *herculeanus* is a "variety" of *subsimilis*, the two are certainly so closely related that to place them in separate genera seems inexcusable. *Aspidiotus coursetiae* Marlatt, which is another species of the same group, is placed in *Diaspidiotus*, while *Aspidiotus covilleae* Ferris, which is very close to if not identical with *coursetiae*, is placed as the type of a new genus, *Ferrisaspis*. I must regretfully reject the honor thus done me.

I repeat that the instances which I have cited above are simply a few of the examples to be found in the treatment of the Diaspinae. An extended analysis will show many others equally worthy of criticism. I can not believe that such work as this can do anything more than extend the confusion already existing in the group.

THE ACADIAN ENTOMOLOGICAL SOCIETY.

It will be of interest to many of the readers of the "Canadian Entomologist" to learn that at the last meeting of the Entomological Society of Nova Scotia, held recently in Halifax, it was decided to broaden out this Society into a Maritime one to include the three provinces, Nova Scotia, New Brunswick and Prince Edward Island.

The name of the Society was also changed from the Entomological Society of Nova Scotia to the Acadian Entomological Society, this name being chosen on account of the fact that the territory embraced by the new Society includes practically the same area as did the ancient Acadia.

The Entomological Society of Nova Scotia has been steadily increasing in numbers and influence since its organization in 1915, and it is felt that this change is another decided step in advance.

NOTE ON THE ROSY APHIS.

BY A. C. BAKER,

Bureau of Entomology, Washington, D.C.

In 1916 W. F. Turner and the writer published some results of a study of the rosy apple aphid. We found that the insect was quite distinct from *A. sorbi* Kalt. of Europe, and, following the lead of Mr. Pergande, we used *malifoliae* Fitch for the species. At the time we had access to only a few of Mr. Pergande's notes and were unaware that he had made studies on *sorbi* in Germany. These studies convinced him that *sorbi* and the rosy aphid are distinct. Theobald reached the same conclusion in England and Gillette from Russian material was equally convinced. All who studied actual material agree, therefore, that two forms are concerned.

At the time we wrote our paper the Fitch type of *malifoliae* was thought to be lost but this has since been located in a group of slides presented to the National Museum by Miss Pergande. This material still bears the original Fitch note book numbers. The species, however, is *crataegifoliae* Fitch, the type of which is also in the National Museum collection. The rosy aphid, therefore, is again without a name, as the former names given it all refer to different insects. We herewith give the species the name *ANURAPHIS ROSEUS*. A full discussion of the synonymy will be given in a paper on the genus *Anuraphis* which will soon be ready for the press.

OBSERVATIONS ON JOHNSONOMYIA FELT WITH A DESCRIPTION OF A NEW SPECIES.

BY E. P. FELT.

Albany, N. Y.

The genus *Johnsonomyia* Felt was erected in 1908 for the reception of a peculiar species collected in Vermont by that ardent and discriminating Dipterist, Mr. C. W. Johnson of the Boston Society of Natural History. A related species was found to occur rather commonly in the vicinity of Albany, a unique representative from Guatemala was described in 1912 and a closely allied species from Brazil in 1915. The types of these, *J. cincta* Felt and *J. braziliensis* Felt, are deposited in the U. S. National Museum and the Cornell University collections respectively. There has just come to hand a most remarkable form from Africa and this in connection with the probable close relationship of the Australian *Chastomera* Skuse indicates a presumably world wide distribution for this peculiar genus, which latter is probably characterized by the possession of 16 antennal segments and has the wing venation of a Porricondylid, though the distinctly heavier veins, the simple fifth vein and the marked hairiness of the wing membrane suggests something unusual, which in connection with the absence of circumfila, has led to the placing of the genus in the Heteropezinae.

***Johnsonomyia alexanderi* n. sp.**

The giant midge characterizing herewith was recently received through the kindness of Dr. C. P. Alexander of the Illinois State Natural History Survey. It was labelled Efulan, Cameroun, V-6-1920, J. A. Reis, Coll. A perusal of the following description shows this giant midge to be a strikingly marked form entirely different from anything heretofore brought to notice.

Female. Length 8 mm. Antennae extending to the fourth abdominal segment, rather thickly haired, mostly light brown, the stems whitish transparent, and probably 16 segments, the first and second segments short, stout, dark brown, the fifth with a stem nearly equal to the length of the basal enlargement, which latter has a length about $2\frac{1}{2}$ times its diameter and is irregularly clothed with setae, there being sub-basally and sub-apically a few very long, dark setae, the interspaces rather thickly filled with shorter, light setae; Palpi presumably quadriarticulate, indistinct in the mount; mesonotum a dull reddish brown; scutellum and postscutellum concolorous; the abdomen sparsely haired, dark brown; the ovipositor dark reddish orange; wings sub-hyaline, the membrane rather thickly clothed with fuscous hairs, sub-costa uniting with the anterior margin at the distal third, the third vein joining the margin well beyond the apex of the wing and united to sub-costa near the basal half by a distinct cross vein, the fifth simple and joining the posterior margin a little before the basal half; halteres dark brown; coxae and legs dark brown except the basal half of tibiae and the distal four tarsal segments, which latter are snow white and suggest the ornamentation of *Bittacomorpha clavipes* Fabr; claws moderately long, stout, black, apparently simple; the pulvilli rudimentary; ovipositor short, the lobes narrowly oval, with a length about three times the width and thickly setose.

Type A. 3196, N. Y. State Museum.

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JOHN MACOUN MEMORIAL.

At the request of naturalists generally throughout Canada, the Ottawa Field-Naturalists' Club has decided to receive subscriptions for a permanent memorial in honor of the late Prof. John Macoun, Naturalist of the Geological Survey of Canada, who died at Sidney, B. C., on July 18, 1920.

The wide field of natural history work to which John Macoun devoted his life is well known, not only throughout Canada but in other countries as well. He specialized particularly in botany and was the founder of the Canadian National herbarium. Other sciences, however, especially zoology, were also greatly enriched by him; he will always be remembered as a great pioneer in Canadian natural history.

Many friends of the late John Macoun, particularly in Toronto and Ottawa, have thought that the memorial should take the form of a painted portrait to be hung in the Victoria Memorial Museum. Such a memorial has now been decided upon and a painting will be made by Mr. Franklin Brownell of Ottawa, the well-known portrait painter. Expenses in connection therewith will be about \$700.

Subscriptions to this fund should be forwarded to Mr. Arthur Gibson, Dominion Entomologist, Ottawa.

Should the list be oversubscribed arrangements may be made whereby those subscribing above a certain sum, which now cannot be defined, will receive a reproduction of the painting.

A. G.

POPULAR AND PRACTICAL ENTOMOLOGY. /

PARASITES OF THE PALE WESTERN CUTWORM IN ALBERTA.

BY E. H. STRICKLAND,

Entomological Branch, Ottawa.*

The pale western cutworm, *Porosagrotis orthogonia* Morr., has been, since 1911, the most destructive insect pest of grain crops in southern Alberta and in a small area of south western Saskatchewan.

The damage in some years amounts to considerably over a million dollars, and all control measures so far employed have proved to be unsuccessful when they are applied to large areas of infestation. For this reason natural control is of superlative importance.

The larvæ of this species are almost entirely subterranean in their habits, and they are never seen above ground by daylight. Hence they are practically immune from destruction by the all too scarce prairie birds. Some fall prey to predators such as *Calosoma frigidum* Kby. and *Ammophila* species, but these represent a very small percentage. No signs of disease have been observed, the

* Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

winter is passed in the egg stage which appears to be little affected by freezing, and the larvæ cannot be drowned, even with excessive irrigation.

Although the species occurs throughout the Great Basin region of the United States, in which it is recorded from five States, it has never appeared there in destructive numbers. Recently it has increased in Montana to an alarming extent.

In the Montana Agricultural Station Circular No. 94, (1920) the statement is made that the "pale western cutworm, remaining as it does below the surface of the ground, is protected from the attacks of parasitic insects." The absence of parasites in this species in Montana has been commented upon in correspondence to the writer both by Professor Cooley, and Mr. J. R. Parker.

This condition is very much at variance with that experienced in Alberta, where parasites are of great importance, and significance. We are able, in most seasons, to predict the severity of outbreaks by a study of the parasite conditions of the previous year in infested districts. Extensive notes have been made on the biology of several of these parasites, but they are still too incomplete for publication.

The following species have been bred in considerable numbers:—

YEAR	HYMENOPTERA	TACHINIDÆ.	ADULT MOTHS	CLIMATIC CONDITIONS
1913	<i>Zele</i> Sp. 1. Specimen.	<i>Bonneto comta</i> 2.5% <i>Gonia capitata</i> 39.0%	?	Medium
1914	<i>Zele</i> Sp. 2.0% <i>Met. dimidiatus</i> 2.0%	<i>G. capitata</i> 43.0% (minimum)	5.0 %	↓ Drought
1915	<i>Met. dimidiatus</i> 2 0 % (estimated)	<i>G. capitata</i> (min) 7.5 % <i>B. comta</i> (min) 11.0 %	13.0 %	Wet
1919	<i>Met. dimidiatus</i> 10.0%	No record. <i>Gonia capitata</i> about 5.0%	?	Dry
1920	<i>Met. dimidiatus</i> 50.0%	Records incomplete	?	Dry

The figures given for Hymenoptera are those obtained by dissection, as are those for Tachinids other than in the years 1914 and 1915. During these years full grown larvae were placed in breeding cages in June and records were kept of the adult moths and parasites that emerged in the fall and following Spring. From the low numbers of cutworms accounted for in these breeding cages,—52% and 33% respectively,—it can be assumed that the actual parasitism was considerably higher than the figures indicate.

Other species bred in small numbers are:—*Peleteria robusta*, Wied. 1913 and *Ernestia radicum* Fab. 1916. Both are Tachinids.

The habits of the more important parasites are briefly as follows:—

Meteorus dimidiatus Cress. (Teste Brues).

Two generations per annum. Hibernates as larvae in overwintering cutworms, such as *Euxoa tristicula* Morr. Adults emerge in May, and parasitize *P. orthogonia* and other Noctuidae. The female lays about twelve eggs in each host. Our records of the date of appearance of the second generation adults indicate a considerable variation from year to year, but the majority have emerged in July.

On account, it is thought, of the underground habits of *P. orthogonia* the percentage of infestation by this Braconid is never as high as it is in the Euxoas, but it is of interest to note that we have bred it from *Sidemia devastator* Brace, a species of cutworm that has never been recorded as coming to the surface. *Gonia capitata* DeGeer, and other Species. (Teste Tothill).

At least two closely allied species of Tachinidae, with similar habits, are included here. The only differences that we have been able to detect are slight variations in larval and adult structures. We have found three types of stage 1 larvae. All of the species have one generation per annum. They hibernate as puparia. The adult emerges in May, and lays thousands of minute eggs on vegetation. When eaten by cutworms these eggs hatch and the escaping larvae mature at about the time that the host pupates. They transform into the hibernating puparium either in the soil, or in the dead larva or pupa of their host.

The selection of vegetation by the fly, and the location of the eggs on selected plants, plays an important role in the value of the parasite.

We have found the most abundant oviposition on the blades of Blue-joint (*Agropyron Smithii*.) though it is frequent on other native grasses, and to a slightly less extent on imported gramineae, including grain crops. Native dicotyledons may carry a few eggs, but we have never found them on introduced plants belonging to this class.

Unfortunately *P. orthogonia* does not feed readily upon Blue-joint and we did not find that *G. capitata* selected the lower portions of the plants for oviposition in preference to the upper. The high percentage of parasitism is rather remarkable since *P. orthogonia* feeds almost entirely below the ground. It would appear, however, that periods of drought are beneficial to this parasite since the reduced growth of vegetation necessitates a more abundant oviposition on available plants.

Bonneta comta Wied. (Teste Tothill).

Very little is known of the life history of this species. The adult appears in July and August, and it belongs to the group of Tachinidae that are larviparous. It is probably, therefore, double brooded, though it has not been bred from overwintering species of cutworms. Regarding the selection of plants for the supposed larviposition the following figures, obtained in 1915, are of interest.

P. orthogonia larvae collected from Spring Wheat were 21% parasitized

P. orthogonia larvae collected from Fall Wheat were 2% parasitized.

P. orthogonia larvae collected from Alfalfa were 0% parasitized.

This suggests a similar habit to that of *Gonia capitata* in the selection of plants.

With a more complete knowledge of the habits of these parasites, particu-

larly of the Tachinids, it may be possible to encourage their increase by the selection of favorable crops, and a consideration of the most advantageous dates of seeding.

PSITHYRUS LABORIOSUS FABR. IN THE NESTS OF BUMBLEBEES (HYM).

BY THEODORE H. FRISON,

Urbana, Illinois.

Of the nine or possibly ten species of the genus *Psithyrus* occurring in America, North of Mexico, only two have ever been recorded from the nests of bumblebees. When Franklin's work on "The Bombidae of the New World" appeared in 1913, there had not been recorded a single authentic instance of a *Psithyrus* having been taken in a bumblebee's nest in this country. The fact that many American writers had mentioned the inquiline habits of *Psithyrus* was entirely due to the numerous European records on the subject.

Mr. F. W. L. Sladen in the Canadian Entomologist for March, 1915, was the first to record the finding of a species of *Psithyrus* in a *Bremus* (*Bombus*) nest in the Nearctic region. In this article he reports the discovery of *Psithyrus insularis* Sm. in the nest of *Bremus* (*Bombus*) *flavifrons* Cress. on July 7, 1914 at Agassiz, British Columbia. In April, 1916 in the Bulletin of the Brooklyn Entomological Society, the writer recorded the presence of *Psithyrus variabilis* Cress. in the nests of *Bremus pennsylvanicus* DeGeer in the summer of 1910 and 1915 at Champaign, Illinois. Several times since then, both in 1917 and 1920, I have taken *Psithyrus variabilis* Cress. in the nests of *Bremus pennsylvanicus* DeGeer:

On July 22, 1919 I removed to the laboratory for closer study a nest of *Bremus* (*Bombus*) *pennsylvanicus* DeGeer. This nest was one of several started in domiciles I had buried in the ground for attracting searching bumblebee queens. The domicile was first noted as being inhabited on June 20, when it contained a small honey-pot and eggs. As the queen was not in the nest I was unable to determine the species at this time (June 20). On July '22, when I removed the nest, it contained a queen and four small workers of *Bremus pennsylvanicus* DeGeer., besides five egg cells containing eggs, two brood masses, and fifteen pupal cocoons. In the nest material near the entrance were the remains of a queen of *Bremus pennsylvanicus* DeGeer and a queen of *Psithyrus laboriosus* Fabr. The two dead queens were mute testimony of the earlier history of this colony. Evidently after the nest was started another queen of *Bremus pennsylvanicus* DeGeer found it, and a struggle ensued over the possession of the nest. Such fighting over the nests is very common in late spring and early summer. Which queen finally won and stung the other to her death is an open question. The dead *Psithyrus* queen can only be accounted for in much the same manner, and all this goes to show that a *Psithyrus* queen is not always peaceably admitted into a bumblebee nest or victorious in a battle with the *Bremus* queen. The history of this colony was followed until September 16, and no *Psithyrus* were ever reared from the nest.

In a nest of *Bremus* (*Bombias*) *auricomus* Robt., about one and one-half

feet below the surface of the ground, examined on July 26, at Clyman Junction, Wisconsin, I found a queen of *Psithyrus laboriosus* Fabr. In this instance also, the *Psithyrus* queen had evidently been stung by the queen bumblebee. When the *Psithyrus* queen was handled, it was barely able to move a leg, and acted in every respect like a bumblebee that had been stung. It was in the nest material near the entrance of the nest, probably having been dragged there by the *Bremus* queen. In the nest at the time, besides these two queens, were twelve workers, fifteen eggs, and some larvae and pupae. It was impossible to make a detailed study of the development of this colony in order to learn if any individuals of *Psithyrus* were eventually produced.

Whether any of the Nearctic species of *Psithyrus* are restricted to the nests of one particular species of *Bremus* or not is still to be decided. Sladen in the previously mentioned article, infers that *Psithyrus insularis* Sm. must at least frequent the nest of another species of bumblebee besides *Bremus flavifrons* Cress., as *Psithyrus insularis* Sm. occurs at Ottawa, Ontario where *Bremus flavifrons* Cress. is not indigenous. From the evidence given above, *Psithyrus laboriosus* Fabr. evidently invades the nests of both *Bremus pennsylvanicus* DeGeer and *Bremus auricomus* Robt., species representing the two subgenera of *Bremus*. If *Psithyrus laboriosus* Fabr. will enter the nests of two such widely separated species as these, it is reasonable to assume that it will frequent the nest of almost any species of bumblebee within its range. About Urbana, Illinois, where *Psithyrus variabilis* Cress. is very common, I have never found it in the nests of any bumblebee species but *Bremus pennsylvanicus* DeGeer, and it remains for future investigation to decide whether *Psithyrus variabilis* Cress. has more than one host.

Edward Saunders in "The Hymenoptera of the British Islands" says that the species of *Psithyrus* appear not always to confine themselves to the same host. Hoffer, one of the closest students of the European *Bremidae*, reports finding *Psithyrus campestris* Panz. in the nests of *Bremus agrorum* Fabr., *B. silvarum* Linn., and *B. variabilis* Schmied. *Psithyrus rupestris* Fabr. and *P. vestalis* Fouc., however, are apparently very closely associated with *Bremus lapidarius* Linn. and *B. terrestris* Linn. Even these last two species of *Psithyrus*, as shown by Sladen in "The Humble-bee" occasionally lodge in a nest of another species of bumblebee.

NOTES ON THE PREPARATORY STAGES OF GNOPHAELA VERMICULATA G. AND R.

BY F. C. WHITEHOUSE.

Red Deer, Alta.

Mid-June 1919 I took some nearly full grown larvae of this species in a tamarack swamp near Red Deer, which pupated about a week later and emerged 11th to 14th July. The larvae were feeding on the borage *Mertensia virginica*. I wrote Dr. McDunnough inquiring if the life history were known, and received reply that the full grown larvae had been twice described in *Entomologica Americana* 1V, 24 and V. 57 but that he had no knowledge of any published notes on the egg or early larval stages. He was kind enough to send me copies of the descriptions referred to.

On 31 July I received from Mrs. W. A. Cassels from Sylvan Lake, Alberta, a female moth and eggs.

Egg—The eggs, 19 in number were laid in rows close together but not touching. In shape round, except at the flattened base. Diameter approximately 1mm. Surface smooth, infinitesimally pitted. Colour rich yellow. Period of incubation (from eggs obtained later) ten days.

6th August, 9 pm: the eggs less yellow, with the black heads of the embryo larvae clearly defined at top: movement of heads noticeable, and also opening and closing of mandibles and protrusion and contraction of mouth-parts. Eggs circumscribed with two or three strands of long black hairs.

7th August 4.30 pm: three larvae hatched, the number by 9 pm. being increased to ten, by 10 p.m. to thirteen, and the balance by morning. Exit obtained by larva eating the shell immediately above head to requisite size for body to pass through. The newly emerged twist and stretch themselves, and take a short respite, after which they make their first meal under new conditions on the empty egg shells, feeding indiscriminately, two or three often at work on the same shell, and even in some instances, endeavouring to get at the broken edge of an egg through which another was hatching.

Larva Stage 1. Length about 2mm. Head black approximately the same width as the body. Colour of body, including tubercles and legs, entirely yellow. Tubercles prominent; setae black, very long—say two to three times diameter of body.

Two or three hours after hatching the ground colour of body has become dirty yellow, and the tubercles, shield on first thoracic segment, and legs, glossy black—the change first noticeable on thoracic shield and fore legs. The tubercles on the abdominal segments 1-8, dorsal view, are situated as follows—a pair anteriorly, and a pair widely separated posteriorly—the four forming a crescent. There are also three or four tubercles on the sides of each segment. Thoracic segments 2 and 3 and abdominal segment 9, dorsal view, have double or twin tubercles widely separated in place of the two pairs of the other segments as above described. The twin tubercles have two hairs, and the oblong shield on thoracic segment 1, four short setae.

8th August. By the evening larvae commenced feeding on the upper and lower surfaces of the leaves of the food plant, leaving the tissue.

10th August. Length 5 mm. A double row of light brown blotches each side of the dorsum and another low down on the sides; the ground colour of the dorsum and sides is now greenish yellow.

14th August. Larvae off their feed all day and by the evening of 15th all have moulted. Length 6-7 m. Appearance radically changed: tubercles larger and bristling with short glossy black setae in place of long single or double hairs of prior stages. Ground colour of dorsum and sides yellow, irregular brown blotches connecting tubercles on either side of dorsum. Head brown.

22nd August. Length 8-9 m. The irregular brown blotches have darkened and extended on the sides—the yellow being less discernible. The yellow dorsal stripe remains, posteriorly broad enough to include the pair of tubercles referred to previously, and again widening at the base of each segment.

27th August. Second moult occurred. Length 9m. Sides mottled brown and yellow: dorsum yellow. Tubercles, from being black, have taken on the metallic-blue luster of the final larval stage; the head, likewise, has assumed the bright chestnut red of the full grown larva; in fact the general appearance is now that of the mature larva prior to pupation.

Absent from home 30th August to 23rd September, and no material change noticeable on my return. Found several larval skins and assume that at least one further moult had taken place. Length still 9m.

29th Sept.—2nd Oct, Another moult.

3rd—11 Oct. Weather cold, snow, and as much as 22 degrees of frost. The leaves of the food plant decayed and turned brown, both in the feeding bottle and in nature. Clearly hibernation must now occur.

12th Oct. Fourteen of the larvae still alive; went to earth.

My material did not re-appear in the Spring, so the satisfaction of rearing the species from egg to moth was not realized. My memoranda would however serve to show that there are at least four moults prior to hibernation; that after the second moult the general appearance is very much that of the full grown larvae, and that the pre-hibernation growth is remarkably slow and retarded—though there is the possibility of this being attributable to captivity to some degree.

I realize that, from the specialist's point of view, the above account leaves much to be desired as to specificness (and probably accuracy) of detail. It is only supposed to be the story of the early stages of the insect as seen by a collector.

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENUS HELINA R.-D., SENS. LAT. (DIPTERA, ANTHOMYIIDAE).

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The forty species included in the present synopsis belong to several closely allied genera, *Helina*, *Hebecnema*, *Spilaria*, *Xenomysdaca*, and *Enoplopteryx*. All of the species would fall within the limits of Stein's genus *Mydaca* but they are undoubtedly a conglomerate group and it is in my opinion necessary to separate the component parts at least as subgenera though I incline to the opinion that they are really entitled to full generic rank. The distinguishing characters of the groups are dealt with in several of my recently published papers on the family and will be summarised in a generic synopsis which is now in manuscript.

KEY TO SPECIES.

MALES.

1. Hypopleura with fine erect hairs usually in a more or less vertical series below middle of spiracle or near posterior margin; eyes with long hairs; prealar bristle short but distinct; scutellum with the setulose hairs continued downward on lateral margins and at times slightly invading ventral surface; basal abdominal sternite with a few hairs. . . . (*Spilaria*) 2.
- Hypopleura with a few long hairs on upper margin in front of spiracle; sides and ventral surface of scutellum bare; first abdominal sternite

- bare.....(Gen. n.) *marmorata* Meigen?
- Hypopleura bare; if with a few hairs below spiracle the sides and ventral surface of scutellum are bare; first abdominal sternite sometimes with a few hairs.....4
2. Hind femur with a few bristly hairs at apex on posteroventral surface, none of which are nearly as long as the diameter of femur where they are situated; eyes densely long haired, separated by a little more than width of anterior ocellus.....*multisetosa* Schnabl
- Hind femur with a number of bristles at apex on posteroventral surface, most of which are distinctly longer than diameter of femur where they are situated.....3.
3. Eyes densely long haired, separated by a little more than width of anterior ocellus; black species, more or less densely gray pruinose, but the dorsum of thorax always shining.....*lucorum* Fallen
- Eyes rather sparsely haired, separated by distinctly more than the width across posterior ocelli; black species, the entire body densely gray pruinose, the dorsum of thorax not distinctly shining.....*punctata* Stein
4. Legs entirely black.....5
- Legs partly yellowish or reddish.....13
5. Eyes separated by nearly one third of the head-width; mid tibia with two very strong anterodorsal bristles; hind tibia with one or two bristles near base on posterodorsal surface; first abdominal sternite setulose.....*latifrontata* Malloch
- Eyes separated by much less than one third of the head-width; mid tibia without anterodorsal bristles except in *nitida* and *nigrita*.....6.
6. Knobs of halteres black.....7.
- Knobs of halteres pale.....9.
7. Margins of calyptae black; eyes with short hairs; arista with its longest hairs as long as width of third antennal segment; posteroventral surface of hind femur without strong bristles; basal abdominal sternite setulose.....*nitida* Stein
- Calyptae yellowish, margins pale; eyes bare.....8.
8. Posteroventral surface of hind femur with a series of strong bristles; longest hairs on arista not longer than its basal diameter; basal abdominal sternite bare; prealar bristle moderately long.....*hannai* sp. n
- Posteroventral surface of hind femur almost bare; longest hairs on arista longer than width of third antennal segment; prealar bristle absent or minute; basal abdominal sternite bare....*Hebecnema vespertina* Fallen
9. Mid tibia with a small protuberance on posterior side beyond middle, which is covered with short setulae, and basad of the protuberance about ten long bristles on the same surface.....*tuberculata* Malloch
- Mid tibia without such protuberance and bristles.....9a.
- 9a. Hind femur with a series of long bristles from base to apex on anteroventral surface, the length of the bristles exceeding the diameter of femur; a few weak hairs sometimes below metathoracic spiracle; basal abdominal sternite setulose.....*nasoni* Malloch

- Hind femur with long bristles confined to apical half of anteroventral surface; basal abdominal sternite bare.....10.
- 10. Abdomen with a black dorsocentral vitta; eyes short haired, almost contiguous.....*Hebecnema umbratica* Meigen.
- Abdomen with paired black dorsal spots; eyes not nearly contiguous....11.
- 11. Thorax with three pairs of postsutural dorsocentral bristles; hind femur with antero-and posteroventral bristles; mid tibia with two weak anterodorsal bristles.....*nigrite* Malloch
- Thorax with four pairs of postsutural dorsocentral bristles; posteroventral surface of hind femur and anterodorsal surface of mid tibia without bristles12.
- 12. Abdomen inconspicuously spotted; wings very conspicuously browned towards base and anteriorly; hind tibia without a bristle near base on posterodorsal surface; eyes separated by less than width across posterior ocelli.....*nigricans* Stein
- Abdomen conspicuously spotted; wings hyaline; hind tibia with a setula near base on posterodorsal surface; eyes separated by at least as great a distance as width across posterior ocelli.....*duplicata* Meigen
- 13. Thorax with four pairs of postsutural dorsocentral bristles.....14.
- Thorax with three pairs of postsutural dorsocentral bristles.....24.
- 14. Femora partly or entirely black.....15.
- Femora entirely pale.....22.
- 15. Eyes with dense long hairs; abdomen ovate, with dorsal paired spots and lateral checkerings.....16.
- Eyes bare or with very short sparse hairs; abdomen not as above.....19.
- 16. Hind femur without bristles on posteroventral surface; hind tibia with long bristles on entire length of anteroventral and posterior surfaces.....*pectinata* Johannsen
- Hind femur with long slender bristles on basal half of posteroventral surface; hind tibia not as above.....17.
- 17. Thorax with one pair of long presutural acrostichal bristles; lateral margins and ventral surface of scutellum bare.....*orbitaseta* Stein
- Thorax without long presutural acrostichal bristles.....18.
- 18. Eyes separated by about the width of anterior ocellus; ventral surface of scutellum bare.....*rufitibia* Stein.
- Eyes separated by at least the width across posterior ocelli; ventral surface of scutellum with sparse erect soft hairs.....*brevis* Stein
- 19. Abdomen with a distinct black dorsocentral vitta; eyes sparsely haired, almost contiguous above; hind femur without bristles on posteroventral surface except near apex.....*Hebecnema vespertina* Fallen
- Abdomen with distinct paired spots on dorsum.....20.
- 20. Third wing-vein bristly at base; hind tibia with a very long anterodorsal median bristle, the apical dorsal one very weak.....*Enoplopteryx anceps* Zetterstedt*
- Third wing-vein bare at base; apical dorsal bristle on hind tibia strong, nearly or quite as long as the median anterodorsal one.....21

* Recorded by Stein but probably erroneously.

21. Prealar bristle present but small; hind femur bare at middle on posteroventral surface; mid tibia without anterodorsal or posteroventral bristles; fifth sternite without strong bristles.....*duplicata* Meigen
- Prealar bristle absent or minute; hind femur with one or two strong, but not very long bristles at middle of posteroventral surface; mid tibia with one or two anterodorsal and posteroventral bristles; fifth abdominal sternite with a very strong bristle on each side of cleft.....*bispinosa* Malloch
22. Thorax shining fulvous, without conspicuous pruinescence; facets on upper half of eyes very conspicuously enlarged, the head flattened above; arista plumose.....*Hebecnema fulva* (Bigot)
- Thorax if fulvous with distinct pruinescence; facets of eyes but little enlarged above, the head not flattened; arista very short haired.....23.
23. Hind tibia with two or more anterodorsal bristles; hind femur with eight to ten bristles extending from middle to apex on anteroventral surface, the longest bristles distinctly longer than the diameter of femur.....*lysinoc* Walker
- Hind tibia with one anterodorsal bristle; hind femur with three or four short bristles at apex on anteroventral surface, none of which exceed in length the diameter of femur.....*uniseta* Stein.
24. Scutellum with a conspicuous black spot on each side at base.....*uliginosa* Fallen
- Scutellum without such spots.....25.
25. Abdomen with an indistinct black dorsocentral vitta; mid tibia with one or two anterodorsal bristles; fore tibia with two posterior bristles; basal abdominal sternite setulose.....*linearis* Malloch
- Abdomen with paired spots on dorsum which are sometimes indistinct; mid tibia almost invariably without anterodorsal bristles.....26.
26. Eyes separated by one third of the head-width; only the fore femora blackened; spots on dorsum of abdomen very indistinct*spinilamellata* Malloch
- Eyes separated by much less than one third of the head-width, or not otherwise as above.....27.
27. Posteroventral surface of hind femur with long hairlike bristles on almost its entire length or on basal half; posterodorsal surface of hind tibia with from one to three short setulae.....28.
- Posteroventral surface of hind femur bare or with a few bristles at middle or near apex; posterodorsal surface of hind tibia without setulae except in *abiens* and *spuria*.....30.
28. Hind tibia with long soft hairs on ventral surfaces....*consimilata* Malloch
- Hind tibia with a few small bristles on anteroventral and posteroventral surfaces, the ventral surface bare.....29.
29. Eyes separated by three times the width across posterior ocelli; legs black*fletcheri* Malloch
- Eyes separated by less than twice the width across posterior ocelli; tibiae and apices of femora reddish yellow.....*nigribasis* Malloch.

30. Hind tibiae with rather dense long bristly hairs on ventral surfaces....30a.
 — Hind tibia without dense bristly hairs on ventral surfaces...30b.
 30a. Hind femur with some long bristly hairs on apical half of posteroventral surface; cross-veins indistinctly infuscated.....*oregonensis* Malloch
 — Hind femur without long bristly hairs on posteroventral surface; cross-veins very conspicuously infuscated.....*cothurnata* Rondani.
 30b. Only the fore femora blackened; palpi yellow; prealar bristle absent; cross-veins not infuscated; hind femur bare at middle on posteroventral surface.....*abiens* Stein
 — All femora more or less blackened; palpi largely or entirely black; prealar bristle distinct except in *spuria*.....31.
 31. Cross-veins of wings very conspicuously infuscated; hind femur bare at middle on posteroventral surface; third vein bare at base; basal abdominal sternite setulose.....*obscurinervis* Stein
 — Cross-veins of wings very narrowly infuscated; hind femur with a few short bristles on middle of posteroventral surface; third wing-vein at base and basal abdominal sternite bare.....*spuria* Malloch
 — Cross-veins of wings not infuscated; hind femur with two or three short bristles at middle of posteroventral surface; third vein with a few weak setulae at base above and below; basal abdominal sternite bare.....*Xenomydaea buccata* Malloch

FEMALES.

1. Hypopleura with some fine hairs below spiracle.....2.
 — Hypopleura with some hairs on its upper margin in front of spiracle.....*marmorata* Meigen?
 — Hypopleura bare.....5.
 2. Hind tibia with three anterodorsal bristles; wing-veins 3 and 4 very decidedly divergent at apices.....*multisetosa* Schnabl
 — Hind tibia with two anterodorsal bristles; veins 3 and 4 very little divergent at apices.....3.
 3. Thoracic and abdominal pruinescence brownish gray; calyptrae yellowish.....*lucorum* Fallen
 — Thoracic and abdominal pruinescence whitish gray; calyptrae white.....*punctata* Stein
 — Thoracic and abdominal pruinescence whitish gray; calyptrae
 4. Legs entirely black, rarely with the knees reddish.....6.
 — Legs with at least the tibiae of one or more pairs reddish or yellowish....
 5. Mid tibia with one or more anterodorsal bristles; hind tibia with one or two posterodorsal setulae near base.....7.
 — Mid tibia without anterodorsal bristles; or the hind tibia has no posterodorsal setulae near base and the arista is nearly bare.....9.
 6. Ventral surface of scutellum with soft erect hairs....*hylemyioides* Malloch
 — Ventral surface of scutellum bare.....7.
 7. Halteres blackish brown.....*nitida* Stein.
 — Halteres pale yellow.....*latifrontata* Malloch
 8. Halteres black.....9.
 — Halteres pale.....10

9. Arista pubescent; calyptrae with black margins....*fuscmarginata* Malloch
- Arista plumose; calyptrae entirely pale.... *Hebecnema vespertina* Fallen
10. Arista plumose; prealar bristle absent or minute; mid tibia without antero-dorsal bristles.....*Hebecnema umbratica* Meigen
- Arista pubescent; prealar bristle more than half as long as the one behind it; mid tibia with one or two anterodorsal bristles..*tuberculata* Malloch
11. Thorax with four pairs of postsutural dorsocentral bristles.....12.
- Thorax with three pairs of postsutural dorsocentral bristles
12. Ventral surface of scutellum with some soft erect hairs at apex; mid tibia with several anterodorsal bristles.....*brevis* Stein
- Ventral surface of scutellum bare.....13.
13. Mid tibia with an anterodorsal bristle; mid and hind femora in part blackened.....*duplicata* Meigen
- Mid tibia without an anterodorsal bristle; mid and hind femora not blackened14.
14. Thorax with a very strong pair of presutural acrostichals..*orbitaseta* Stein
- Thorax without a strong pair of presutural acrostichals....*rufitibia* Stein
15. Abdomen checkered, without distinct paired dorsal spots; palpi black....16.
- Abdomen with paired dorsal black or brown spots, if the spots are indistinct the ground colour of the abdomen and sometimes of the thorax is more or less testaceous and the palpi are entirely or largely yellow.....17.
16. Antennae entirely black.....*mimetica* Malloch
- Third antennal segment conspicuously reddish yellow at base.....*johnsoni* Malloch
17. Longest hairs on arista about as long as width of third antennal segment.....*Hebecnema fulva* Bigot
- Arista much shorter haired.....18.
18. Hind tibia with one anterodorsal bristle; abdomen black, densely gray pruinose, with black paired dorsal spots; palpi broadly infuscated at apices.....*uniseta* Stein
- Hind tibia with two anterodorsal bristles; abdomen more or less testaceous, gray pruinose, with poorly defined brown paired spots on dorsum; palpi entirely yellow.....*lysinoc* Walker
19. Scutellum with a conspicuous black spot on each side at base.....*uliginosa* Fallen
- Scutellum without such spots.....20.
20. Third wing-vein with a few weak setulae at base above and below.....*Xenomysdaca buccata* Malloch
- Third wing-vein bare at base.....21.
21. Wings with the cross-veins very conspicuously infuscated; hind tibia without posterodorsal setulae near base.....22.
- Wings with the cross-veins not or but slightly infuscated, or the hind tibia has one or more posterodorsal setulae near base.....24.
22. Thorax entirely yellowish testaceous; head and abdomen fuscous; arista with its longest hairs distinctly shorter than width of third antennal segment.....*bicolorata* Malloch

- Thorax largely or entirely blackish.....23.
- 23. Arista with its longest hairs about equal in length to width of third antennal segment; hind femur with one or two long bristles at middle on posteroventral surface.....*obscurinervis* Stein
- Arista with its longest hairs about as long as its basal diameter; hind femur without bristles at middle on posteroventral surface.....*neopocilloptera* Malloch
- 24. Hind tibia with one setula near base on posterodorsal surface.....sp.
- Hind tibia with three or four setulae on posterodorsal surface.....25.
- 25. Only the fore femora infuscated; antennae with second segment and base of third ferruginous; longest hairs on arista longer than width of third antennal segment; fore tibia with one posterior bristle; mid tibia without an anterodorsal bristle.....*abiens* Stein
- Mid and hind femora as well as fore pair infuscated at bases; antennae entirely black; longest hairs on arista a little shorter than width of third antennal segment; fore tibia with one anterodorsal and usually two posterior bristles; mid tibia with an anterodorsal bristle.....*nigribasis* Malloch
- Only the fore femora infuscated; antennae with second segment reddish; longest hairs on arista distinctly shorter than width of third antennal segment.....*spuria* Malloch

***Helina hannai* sp. n.**

Male and Female.—Black, almost glossy. Orbits and cheeks with white pruinescence, frontal stripe opaque black; antennae and palpi black. Thorax indistinctly trivittate. Abdomen with brownish gray pruinescence, and a continuous dorsocentral black vitta. Legs black. Wings slightly fuscous, bases of veins yellow. Calyptrae bright yellow. Knobs of halteres black.

Eyes of male separated by about one tenth of the head-width; arista very pubescent; eyes almost bare. Thorax with 4 pairs of postsutural dorsocentral bristles; prealar bristle long. Abdomen subcylindrical, slightly tapered at apex; hypopygium small. Fore tibia with two or three setulae on posteroventral surface; mid tibia with two posterior bristles; hind tibia with two anterodorsal and two anteroventral bristles; hind femur with a continuous series of long bristles on anteroventral surface and some on basal half of posteroventral.

Female.—Frons over one third of the head-width; arista pubescent as in male.

Length, 6.5—7.5 mm.

Type.—St. George Island, Behring Straits, June 24, 1914. Allotype and two paratypes, same data as type; one male paratype and puparium, same locality, June 20, 1913; one male, June 10, 1914; one male and two females, June 17, 1914 (G. D. Hanna).

Named in honor of the collector.

Type in collection of United States Bureau of Biological Survey.

A FURTHER COMPARISON OF THE WINGS OF ZORAPTERA, PSOCIDS, AND APHIDS, FROM THE STANDPOINT OF PHYLOGENY.

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The venation of the fore wings of the Zoraptera, Psocids, Aphids, and related forms was discussed in a recent paper published in Vol. 32, p. 97, of the Entomological News for 1921; but the venation of the hind wings of these insects was not included in the paper referred to above, since material suitable for determining the homologies of the peculiar venation of the hind wings of the Zoraptera was not available at that time. Recently, however, through the kindness of Mr. Nathan Banks, I have been able to study the venation of the aberrant psocids figured by Enderlein 1903-1906, which have enabled me readily to homologize the veins of the hind wing of Zoraptera; and since Enderlein's principal paper was published in a Hungarian periodical which is doubtless inaccessible to many cisatlantic entomologists, I have included in the present paper such of Enderlein's figures as are of value for determining the homologies of the veins of both wings in the Zoraptera, and for determining the closest affinities of these insects. For the privilege of studying the wings of the intensely interesting and phylogenetically important order Zoraptera, I am indebted to the kindness of Mr. A. N. Caudell whose sympathetic interest, and unfailing readiness to lend assistance, has been a source of inspiration and encouragement to many a student in the field of entomological research.

The affinities of the Zoraptera have been discussed by Silvestri, 1913, Caudell, 1920, and Crampton, 1920, and all of these investigators were apparently impressed by the resemblance of the Zoraptera to the Isoptera in their general appearance, their colonial habits, the breaking off of the wings, and in certain details of thoracic and abdominal structures. I have emphasized the fact, however, that the Zoraptera are strikingly like the ancestors of the Psocids, and in an article published in Vol. 32, p. 97, of the Ent. News I have grouped the Zoraptera, Psocids, Mallophaga, Anopleura, Thysanoptera, Palaeohemiptera, Homoptera and Hemiptera, etc., in a common super-order, the "Panhomoptera" (instead of grouping the Zoraptera with the Isoptera, as in former papers) and likewise called attention to the fact that "the resemblance of both fore and hind wings of the Psocid *Archipsocus textor* to the wings of the Zoraptera is strikingly close." In the present paper, I would present the evidence of the wing veins supporting the contention that the Zoraptera are nearer to the Psocids than to any other insects; and that the Zoraptera should therefore be placed in the super-order Panhomoptera next to the Psocid members of this group; and I would also call attention to the fact that the wings of the Zoraptera are very suggestive of those of the Hymenoptera in certain respects—a resemblance which likewise extends to certain of the body structures as well.

So far as the wings are concerned, the resemblance between the Zoraptera and the Psocids is so marked, that they might readily be grouped in the same order, if the wings were the only features to be considered, since the wing venation of the Psocid sub-family Archipsocinae is even more like that of the Zorap-

tera than it is like that of many other insects grouped with them in the order Psocida, and the range of variation in the wing venation of members of this order covers far greater differences of venation than that between the Psocid group Archipsocinae and the Zoraptera. The genitalia of the Zoraptera, however, are quite different from the genitalia of the Psocids, the Zoraptera have well developed cerci, which are absent in all Psocids of which I have any knowledge, the head is of a more primitive type (and the mouthparts also) in the Zoraptera, as is also true of the thoracic sclerites of the sternal and pleural regions, and many other features, which would preclude our placing the Zoraptera in the same order with the Psocids, although the relationship between the two groups is far closer than has hitherto been supposed to be the case.

The fore wing of *Archipsocus brasilianus* shown in Fig. 10, Plate III, is strikingly similar to that of *Zorotypus snyderi* shown in Fig. 12, since in both insects, the cubitus is two-branched (i.e. it divides into "Cu₁" and "Cu₂"), while the median vein "M", is unbranched and bends upward toward "R_s" very abruptly, forming a slight connection with the latter, before bending down again toward the posterior margin of the wing. Vein "R_s" is very similar in both insects, and a comparison of Fig. 12 with Fig. 10 would indicate that in *Zorotypus snyderi* (Fig. 12) vein "R₁+₂" has become lost, while only the branch "R₂+₃" of the two branches of "R_s" present in Fig. 10, persists to form the terminal portion of the vein labeled "R_s" in Fig. 12 i.e. the portion labeled "R₂+₃" in Fig. 12). The pterostigma "ps" is very similar in both insects, and the fore wings of *Zorotypus snyderi* and *Archipsocus brasilianus* exhibit so many tendencies in common in their modifications, that one cannot escape the conclusion that the two insects are extremely closely related.

In *Archipsocus brasilianus* (Fig. 10) as in *Zorotypus snyderi* (Fig. 12) vein "M" of the fore wing is barely connected with "R_s"; but in *Archipsocus recens* (Fig. 9) vein "M" of the fore wing has coalesced with vein "R_s" for a considerable distance to form "R_s+M", and the same is true of the fore wing of *Zorotypus hubbardi* shown in Fig. 11. We thus have the modificational tendencies exhibited by the fore wing of *Archipsocus brasilianus* repeated in the Zorapteron *Zorotypus snyderi*, while the modificational tendencies exhibited by the fore wing of *Archipsocus recens* are repeated in the Zorapteron *Zorotypus hubbardi*; and anyone who will compare the fore wings in the two groups of insects must be impressed with the remarkable similarity between the two types of wings.

The resemblance between the hind wings of the Zoraptera and Psocids is no less remarkable than the resemblances exhibited by the fore wings in the two groups of insects. Thus, in the hind wing of *Zorotypus snyderi* shown in Fig. 3 (which is almost exactly like that of *Zorotypus hubbardi*), vein "R₂+₃" is almost an exact counterpart of vein "R₂+₃" in Fig. 5 of the hind wing of *Archipsocus recens*, as is also true of vein "M₂" in both insects. Vein "R_s" has united with "M" and with "M+Cu" for a greater distance in the insect shown in Fig. 3 than in the insect shown in Fig. 5, and the small cell just below the label "R_s" in Fig. 5, has become obliterated in Fig. 3; but the cubitus "Cu₂" is much the same in the two insects, although the anal lobe "al" of Fig. 5, is not represented

in Fig. 3, nor is vein "R₁" of Fig. 5 represented in Fig. 3. The differences between the two types of wings are very slight, when one takes into consideration the fact that they belong to insects grouped in separate orders, and the wing of the Zorapteron shown in Fig. 3, is actually more like the Psocid shown in Fig. 5, than this Psocid is like many other members of its own order of insects (the Psocida), as one may readily see by comparing it with *Cymatopsocus opalinus* and similar Psocids. At any rate, it is a comparatively simple matter to homologize the veins of the Zorapteron wing shown in Fig. 3, with the veins of the Psocid wing shown in Fig. 5, and by working back to the intermediate type of venation exhibited by the wing shown in Fig. 6, we have a connecting link passing over into the more typical venation of the order.

Veins "R₂₊₃" and "R₄₊₅" are distinct in the wing of *Psyllipsocus ramburi* shown in Fig. 6; but in the hind wing of an aberrant form of this species, figured by Enderlein, 1903, these two veins have united almost completely (they are separate only near the margin of the wing, and for a very short distance) which suggests that the vein labeled "R₂₊₃" in Fig. 5, represents the fusion product of veins "R₂₊₃" and "R₄₊₅" of Fig. 6. Similarly, the vein labeled "M₂" in Fig. 5, probably represents the fusion product of veins "M₁" and "M₂" of Fig. 6, and the same holds true for the venation of the wing shown in Fig. 3, which is homologous with the venation of the wing shown in Fig. 5. The discal cell below the label "R₅" in Fig. 5 is represented by a similar cell below the letter "R" in Fig. 6 (this cell has become obliterated in Fig. 3); but the longitudinal vein "R₄" of Fig. 5 has assumed a more vertical position in Fig. 6, in which the vein labeled "R₁" may represent only a portion of vein "R₁" of Fig. 5, or the latter vein may have coalesced with the veins behind it, save for its terminal portion which remains free to form the vein labeled "R₁" in Fig. 6. The Vein "Cu₂" of Fig. 5, is evidently the homologue of the vein labeled "Cu₂" in Fig. 6, and it is quite impossible that vein "Cu₁" has united with "Cu₂" to form the single vein labeled "Cu₂" in both figures, although there is not positive evidence available to determine this point; and it is also quite possible that the vein labeled "Cu₂" represents only the second branch of cubitus, the first branch (i.e. "Cu₁") having faded out, or become lost in some such fashion. When a wider series and more intermediate forms of Psocids have been studied, these points may be determined with more certainty, although an examination of the tracheation of the insects in question would likewise throw much light upon the matter, if one could procure fresh material for study. These points, however, are of minor importance, and so far as the principal longitudinal veins are concerned, it is a comparatively simple matter to determine their homologies in the Zoraptera and Psocids, the only matter of uncertainty being to determine which of the branches of these longitudinal veins are lost, or unite with other branches to form the terminal portions of the longitudinal veins.

The hind wing of the Aphid shown in Fig. 1 is rather suggestive of the hind wing of the Zoraptera (Fig. 3) in its venation. The vein "Cu₂" of Fig. 1, however, is situated further (distally) from the base of the wing and is proportionately much longer than vein "Cu₂" of Fig. 3, and vein "R₅" is bent abruptly forward in Fig. 3 while it extends more nearly in a straight line with the basal

portion of the vein in Fig. 1. The fore wing of an Aphid (Fig. 7) however, is more like that of a Psocid (Fig. 8) than that of a Zorapteron (Fig. 11), and the nature of the veins A., and "Cu₂" of Fig. 8 is very suggestive of the condition exhibited by these veins in Fig. 7. The incomplete vein "R_s" of Fig. 8 is also very suggestive of vein "R_s" of Fig. 7; but the point of origin and the extent of vein "M" of Fig. 8, is somewhat different from that of the vein bearing the same label in Fig. 7. On the whole, however, the resemblance between the types of wings shown in Figs. 7 and 8 is very striking, and adds further weight to the evidence drawn from other sources indicating that the Psocids represent as nearly as any living forms, the ancestral types from which the Aphids and other Homopterous insects were derived.

The venation of the fore wing of the Psocid shown in Fig. 2 approaches remarkably closely the type of venation occurring in the Thysanoptera;* and since it furnishes us with the basis for determining the homologies of the Thysanopteron venation, it is of considerable importance to make as accurate a determination of the venation of the Psocid in question as it is possible to do from the evidence at hand. A comparison of *Embidotroctes* (Fig. 2) with *Embidopsocus* (Fig. 4) which is slightly less modified than the former insect, would indicate that branch "R₁+₂" is either lost, or coalesces with "R₁+₃" (Fig. 4) to form the terminal portion of the vein labeled "R" in Fig. 2. I am more inclined to consider that vein "R₂+₃" of Fig. 4 is lost, in Fig. 2; and hence the terminal portion of vein "R_s" of Fig. 2 would be formed by "R₁+₃" alone. The reason for so thinking is that in the fossil Thysanopteron *Palacothrips fossilis*, the terminal portion of a similar vein appears to be formed by "R₁+₃", while vein "R₂+₃" becomes vertical, and takes on the appearance of a cross vein connecting it with the anterior margin of the wing. This matter, however, will be discussed more at length in a subsequent paper, and need not be further considered here. It may be remarked in passing that the terminal portion of vein "M" of Figs. 2 and 4, is probably composed of "M₁", as is indicated by the labelling.

The principal points brought out in the preceeding discussion may be briefly summarized as follows. The Psocids are much nearer the Zoraptera than has formerly been supposed to be the case, and so far as the wing veins are concerned, the Psocid family Caeciliidae approaches the Zoraptera much more closely than any other known insects, the wings of the Psocid *Archipsocus brasilianus* (Fig. 10) being remarkably like those of the Zorapteron *Zorotypus snyderi* (Fig. 12) while the wings of the Psocid *Archipsocus rccens* (Fig. 9) are remarkably like those of the Zorapteron *Zorotypus hubbardi* (Fig. 11). In both groups of insects there is a tendency to form a pterostigma "ps", and there is also a tendency toward the formation of a thickening of the margin of the wing to form a sort of "ambient" vein like that found in the Thysanoptera. In both Zorapteron and Caeciliid fore wings, the vein "R₂+₃" tends to curve forward toward the anterior margin of the wing, and vein "M" is unbranched, and tends to bend backward toward the posterior margin of the wing. Vein "Cu" is two branch-

* The veins labeled "M" and "Cu₁" in Fig. 3 of the fossil Thysanopteron described in Ent. News Vol. 32, p. 97, should be labeled "M₁" and "M₂", judging from the evidence furnished by a study of the wings discussed in the present paper.

ed in both groups, in the fore wing, and is unbranched in the hind wing. The course of veins "R₂+3" and "M₂" is astonishingly similar in the hind wings of both types of insects.

While it has no direct bearing on the matter of indicating a close relationship between the two groups, it may be mentioned that in the Psocids there is a marked tendency toward the development of aberrations in the venation of certain individuals, and the venation of the wing of one side of the body may even differ from that of its fellow on the other side of the body. Similarly in the Zoraptera, there is also exhibited a marked tendency toward a variation in the venation of certain individuals, and in a specimen of *Zorotypus snyderi* which I have examined, the venation of the right fore wing was quite different from that of the left fore wing, thus suggesting the operation of similar tendencies in the two groups of insects.

The evidence of the wing venation would add further support to the indications of an extremely close relationship between Zoraptera and Psocids furnished by other features of the body, and this relationship is so intimate that it is quite evident that the Zoraptera should be placed in the superorder Panhomoptera next to the Psocids. Furthermore, the Zoraptera are the nearest living representatives of the types ancestral to the Psocids, and these in turn are very like the ancestors of the Thysanoptera, Mallophaga, Anopleura, Hemiptera and Homoptera.

The orders of winged insects may be grouped into the following superorders, according to the revised views expressed in an article recently published in *Psyche*, Vol. 27, 1920, p. 125, which are further modified to a slight extent, in the following list.

- Palaeodictyopteroid Superorder (Panpalaeodictyoptera or Ephemeriformia)....
 Protephemeroida, Ephemeroida, Protodonata, Odonata, Palaeodictyoptera,
 "Protohemiptera" etc.
- Plecopteroid Superorder (Panplecoptera or Perliformia).....
 Haplopteroida, Plecoptera, Hadentomoida, Embioida, Dermaptera, etc.
- Orthopteroid Superorder (Panorthoptera or Phasmiiformia).....
 Protorthoptera, Grylloblattoida, Phasmoida, Orthoptera, etc.
- Isopteroid Superorder (Panisoptera or Blattiformia).....
 Protoblattoida, Blattoida, Mantoida, Isoptera, etc.
- Psocoid Superorder (Panhomoptera or Psociformia).....
 Zoraptera, Psocoida, Mallophaga, Pediculoida, Thysanoptera, Homoptera,
 Hemiptera, Palaeohemiptera, etc.
- Neuropteroid Superorder (Panneuroptera or Sialiformia).....
 Neuroptera, Hymenoptera, Mecoptera, Protomecoptera, Paramecoptera,
 Paratrichoptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera, etc. The
 Coleoptera and Strepsiptera may eventually be placed in this superorder,
 but I have not been able to definitely decide concerning them or such forms
 as the Megasecoptera, etc., which are also related to members of this super-
 order.

The Plecopteroid superorder appears to lead to the Neuropteroid superorder, while the Isopteroid superorder appears to lead to the Psocoid superorder,

in some respects. The Orthopteroid superorder is somewhat intermediate between the Isopteroid superorder and the Plecopteroid superorder with its closest affinities very slightly nearer the former, though the balance between the Isopteroid and Plecopteroid characters in the Orthopteroid group is fairly evenly divided. The Isopteroid and Plecopteroid superorders are both very close to the Palaeodictyopteroid group, which may represent the common ancestors of both.

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ABBREVIATIONS.

The numerals written to the right and below the letters indicate branches of the veins referred to. A plus sign between letters indicates a coalescence of the veins in question.

al....Anolobus or anal lobe (vestigial anoflabellum, or anal fan of lower insects).

A....First anal vein.

ap...Anoplica, or anal fold.

as...Anosinus, or anal sinus.

ax...Axillary vein (second anal).

ch...Costahamus, or costal hook.

Cu...Cubitus.

M...Media.

ps...Pterostigma.

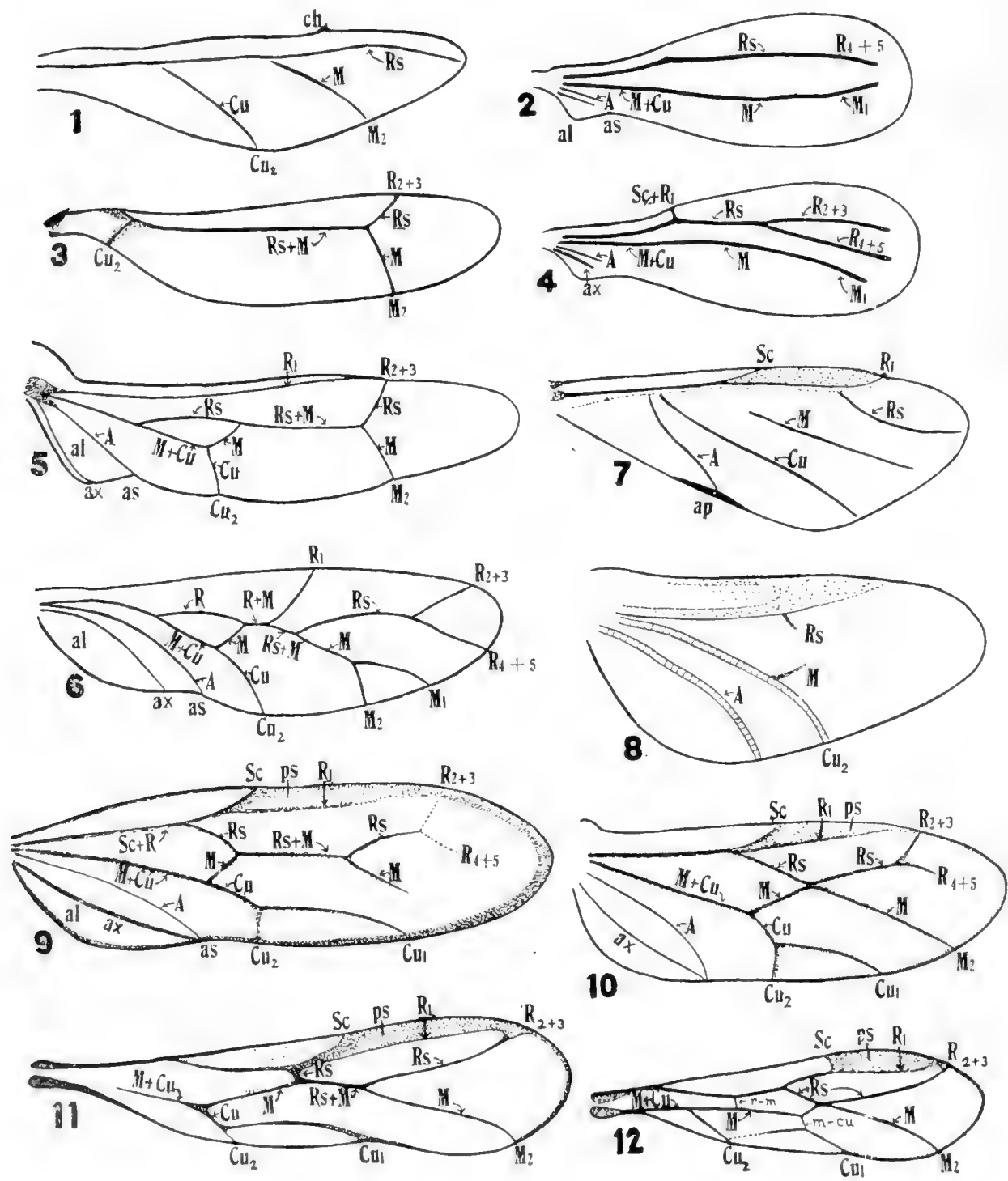
R...Radius.

R_s...Radial sector.

Sc...Subcosta.

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Plate III.



COMPARISON OF WINGS OF ZORAPTERA, PSOCIDS AND APHIDS.

(See page 117)

EXPLANATION OF PLATE III.

Figures 2, 4, 5, 6, 8, 9, and 10 are based on figures by Escherich. Figures 1 and 7 are based upon figures by Patch, 1909.

Fig. 1...Right hind wing of Aphid *Macrosiphum solanifolii*.

Fig. 2...Right fore wing of Psocid *Embidotroctes paradoxus*.

Fig. 3...Right hind wing of Zorapteron *Zorotypus snyderi*.

Fig. 4...Right fore wing of Psocid *Embidopsocus luteus*.

Fig. 5...Right hind wing of Psocid *Archipsocus recens*.

Fig. 6...Right hind wing of Psocid *Psyllipsocus ramburi*.

Fig. 7...Right fore wing of Aphid *Pamphigus venafuscus*.

Fig. 8...Right fore wing of brachypterous form of Psocid *Archipsocus brasilianus*.

Fig. 9...Right fore wing of Psocid *Archipsocus recens*.

Fig. 10...Right fore wing of Psocid *Archipsocus brasilianus*.

Fig. 11...Right fore wing of Zorapteron *Zorotypus hubbardi*.

Fig. 12...Right fore wing of Zorapteron *Zorotypus snyderi*, after Crampton, 1921. This wing should be of same size as that of the Zorapteron shown in Fig. 11.

TWO NEW CANADIAN MAY-FLIES (EPHEMERIDAE).

BY J. MCDUNNOUGH, PH. D.

Entomological Branch, Ottawa.*

In the second week of June, 1920, I collected from the underside of the leaves of an ash tree, situated near the banks of the Rideau river a number of specimens of both sexes of those tiny May flies belonging to the genus *Bactis*. At the time I supposed I was collecting *Bactis pygmaea* Hagen, but a careful study of the entire material at a later date convinced me that three species were represented and could be fairly readily distinguished, even in a dried condition, by the relative size of the superior, reddish portion of the eyes.

It became necessary therefore to determine whether the true *pygmaea* was represented in my catch and specimens of all three species were submitted to Dr. Nathan Banks of the Cambridge Museum, Mass. Dr. Banks was kind enough to compare these specimens carefully with the remains of the type ♀ of *B. pygmaea* (one wing and a portion of thorax) as well as with the type ♀ of *B. unicolor* Hagen and co-types of *B. propinquus* Walsh. One of the species he definitely identified as *propinquus*, the other two he reported as probably new, both being considerably larger than *pygmaea* and showing constant differences in venation, notably in the hinder portion of the wing.

Unicolor was described from ♀'s only, collected in Washington, D. C., and until the correct ♂'s can be definitely associated with the opposite sex, identification of this species must remain doubtful. The same is more or less true of *pygmaea*; the type locality is given as "St. Lawrence River" and until we have more definite knowledge of the *Bactis* forms inhabiting this river, it would be mere guess work, in view of the very close superficial resemblance between the

* Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

species of this group, to associate the name definitely with any of our Ottawa species. The only other name in this genus which might possibly have been applied to our forms was *rubescens* Prov., a species unknown to Dr. Banks. Through the kindness of Canon Huard I have received for study the only two species in the Provancher Collection labelled with this name in Provancher's handwriting; one specimen, a ♀, is very evidently not the type nor even correctly associated; it is a species of *Chiroteneutes*. The other, a ♂, agrees well with Provancher's short description, having the costa and base of primaries and a good portion of the secondaries tinged with ruddy colour. It does not however belong in the genus *Baetis* but in *Baetisca* and is apparently distinct specifically from *obesa* Say, the sole species at present included in the genus. I propose making this specimen the Lectotype and transferring the specific name to the correct genus.

In view of the above facts it seems advisable to give names to the two unknown species; the ♂'s may be separated from one another as follows:—

- a. Superior eyes large, kidney-shaped; intercalaries on primaries well developed, especially between subcosta and radius... *intercalaris*, n. sp.
- a' Eyes smaller, oval; intercalaries between subcosta and radius either faint or entirely lacking.
- b. Superior eyes moderate, roundly oval; thorax of ♂ shiny black *propinquus* Wlsh.
- b' Superior eyes small, lengthily oval; thorax brown with distinct lateral yellow spot on prothorax extended backward by a line to base of wing..... *flavistriga*, n. sp.

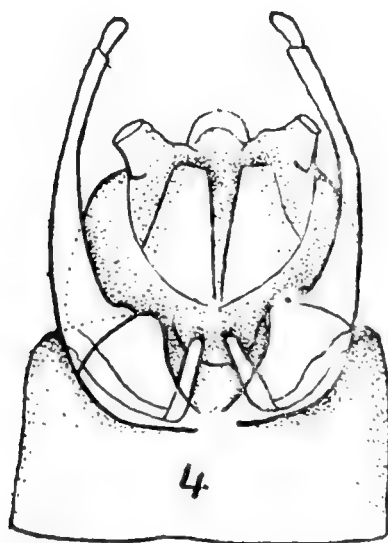
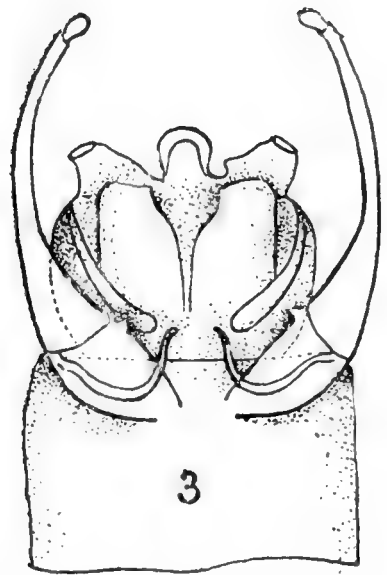
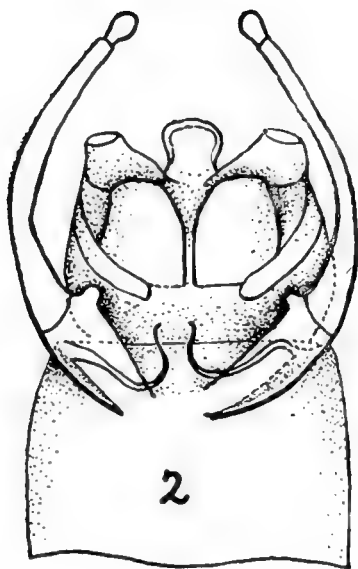
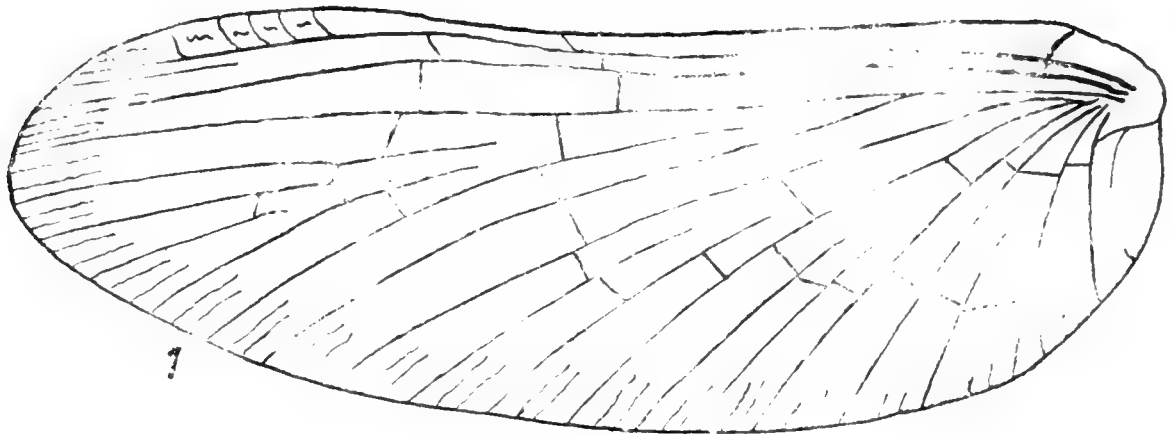
All the species agree in the ♂ sex in the type of abdominal marking, the first and the last three segments (apart from genitalia) being brown, the remainder hyaline white with black stigmal dots. A detailed description of the new species follows:—

***Baetis intercalaris* N. Sp.**

- ♂. Length of wing (from center of thorax to wing tip) 5 mm; length of body 4½ mm; length of abdominal setae 9-10 mm. Legs pale yellowish, antennae blackish at base shading to whitish at tips; lower eyes black; superior eyes large, brownish red, kidney-shaped, pale around the rims, which in dried material are usually curled up. Thorax black-brown, slightly marked with yellowish on the dorsal protuberances and with a yellowish lateral prothoracic line extending to base of wing; abdomen with basal segment dull brown, last three segments ruddy-brown dorsally; remaining segments pale yellowish white; beneath all segments but the first uniformly whitish; genital organs pale; setae white. Wings with the intercalaries on primaries well marked, the two in the interspace between subcosta and radius particularly long; cross-veins between branches of cubitus distinct.

In the genitalia the penes are curved, rod-like, tapering to a very fine point, slightly bent at tip.

- ♀. Eyes small, wide apart, blackish; face variegated brown and yellow; dorsum of thorax slaty-black, laterally and abdominally brownish; abdomen brownish above, dull yellowish gray below; setae dirty white, duller than in ♂; legs



NEW CANADIAN MAY-FLIES

(See page 117)

deeper in colour than in ♂; venation similar to that of ♂.

Holotype. 1 ♂, Ottawa (June 11th,) in Canadian National Collection.

Allotype. 1 ♀, Ottawa (June 11th.) in Canadian National Collection.

Paratypes 6♂'s, 6♀'s, Ottawa (June 11-14) in Canadian National Collection and Cambridge Museum Collection.

***Baetis flavistriga* N. Sp.**

- ♂. Size and general appearance of the preceding species; the superior eyes however much smaller, forming, even in dried specimens, flat, oval disks of a deep reddish brown colour, which often slightly overlap. Thorax with the yellow prothoracic spot and streak well-defined; legs dirty ochreous. Primaries with the intercalaries less developed than in the preceding species, those between subcosta and radius being much shorter; the cross-veins between the branches of the cubitus are also quite faint in distinction to *intercalaris* where they are well-developed. In the genitalia the penes are of more or less even width throughout and do not taper to the fine points found in *intercalaris*.

Holotype. 1 ♂, Ottawa (June 14th) in Canadian National Collection.

Paratypes. 5 ♂'s, same locality and date, in Canadian National Collection and Cambridge Museum Collection.

I have not yet definitely associated the ♀'s of the above species; a series of this sex is before me which differs from the ♀'s of *intercalaris* in possessing a broad pale yellow dorsal stripe on the abdomen and further shows the differences in venation mentioned above. These specimens however may belong to *propinquus* Wlsh. as Dr. Banks mentions to me that the female cotype of this species appears to possess such a stripe. In view of this I have thought it better to leave the matter in abeyance until such time as further collecting or breeding can settle the doubt.

EXPLANATION OF PLATE.

Fig. 1 Venation of forewing of *Baetis intercalaris* McD.

Fig. 2 Male appendages of *Baetis intercalaris* McD.

Fig. 3 Male appendages of *Baetis flavistriga* McD.

Fig. 4 Male appendages of *Baetis propinquus* Walsh.

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No. 6

POPULAR AND PRACTICAL ENTOMOLOGY.

STRIGODERMA ARBORICOLA FAB.—ITS LIFE-CYCLE (SCARAB. COLEOP).

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*Contribution No. 59 from the Entomological Laboratory, Kansas State Agricultural College. This paper embodies some of the results of the investigations undertaken by the author in the prosecution of project No. 100 of the Kansas Agricultural Experiment Station.

INTRODUCTION.

Continuation of the work on the life-cycle of insects injurious to the roots of staple crops, begun at this station in 1916, has revealed the following life-cycle of *Strigoderma arboricola* Fab. This species of the family Scarabæidae, sub-family Rutelini, occurs somewhat generally throughout the state of Kansas. Popenoe (1877) records the beetles from western Kansas, and states that they are quite rare at Topeka. Casey (1915) gives the range of *Strigoderma arboricola* as occurring from New Jersey and Canada to Kansas. Only at rare intervals are they sufficiently abundant in Kansas to be of economic importance.

An opportunity to secure enough specimens to begin life history studies was afforded the writer by the collection of a number of the beetles by Prof. Geo. A. Dean at Abilene, Kansas, June 20, 1919. At this place they were found abundantly feeding on rose blossoms in a nursery where they were doing considerable damage. These beetles were brought to Manhattan where their subsequent life history was worked out. To date, the writer has been unable to find any reference to the life-cycle of this species in American literature.

The beetles were kept in large, covered tin pails containing damp soil. Various blossoms were fed to the adults and the soil examined daily after oviposition began. The freshly laid eggs were transferred to small depressions in closely packed soil in one ounce tin salve boxes where they were examined daily for hatching. Upon hatching, the young grubs were placed in individual salve boxes containing loose, damp soil, which was changed once or twice a week during the warm weather. They were kept constantly in a rearing cave (McColloch, 1917), where a somewhat constant temperature was maintained. The young grubs were fed bran until the second molt, when wheat grains were substituted. When the prepupal condition occurred, fresh soil was packed tightly in the salve box to approximate the natural condition of the pupal cell in which the transformations to the pupal and adult conditions took place.

FOOD PLANTS.

Hart and Gleason (1907, p. 244) record *Strigoderma arboricola* adults on flowers of clover, rose, *Opuntia humifusa* and *Monarda punctata*. Blatchley (1910, p. 986) records the beetles as occurring most commonly on flowers of wild rose, blackberry and the water willow, *Dianthera americana* Linn. The

following field notes are recorded by Vestal (1913, p. 45): "Notes taken June 24. The first *Strigoderma* was noticed a few days ago floating down the river. They are now excessively abundant on cactus, wild rose, red clover, timothy, elderberry, dewberry, dog fennel, *Verbena stricta*, wild parsnip, *Monarda punctata*, *Plantago*, *Saponaria*, *Tephrosia*, *Erigeron*. They are most abundant on prairie plants, being quite common in the bunch-grass association and along roadsides, very few being found in the forest'. July 3: '*Strigoderma* is still fairly abundant on different flowers. On July 6, a robber-fly, *Proctacanthus brevipennis*, was caught with a *Strigoderma* in its grasp, which it was in the act of eating." In Kansas, blossoms of wild and cultivated rose plants are apparently the preferred food of the beetles.

The grubs were not observed feeding in nature. However, the fact that they were reared on bran and wheat kernels in the same manner that the writer has reared *Lachnosterna* grubs seems to indicate that there is no apparent difference between the feeding habits of this species and those of the more common white grubs.

LIFE CYCLE.

Adult.—The beetle is described by Blatchley (loc. cit.) as follows: "Oval, subdepressed. Head, thorax and scutellum dull blackish-green, shining; sides of thorax usually in part or wholly pale; elytra dull brownish-yellow, often suffused with fuscous or piceous, especially on the sides and along the suture; under surface and legs piceous, sparsely clothed with long grayish hairs. Head coarsely, roughly and confluent punctured. Thorax one-half broader than long, sides feeble curved, hind angles rounded, front ones acute; surface coarsely, shallowly and rather sparsely punctate, with an impressed median line on middle third and two irregular depressions on each side. Elytra with all the striae distinct, entire and deeply impressed. Length 10-12 mm."

He further states that two specimens observed had the thorax, elytra and legs wholly reddish-yellow and others had the thorax wholly bluish-black. The beetles occur on blossoms from May to July, where mating probably occurs.

A collection of 53 specimens made July 9, 1885, in Wallace County, Kansas, indicates their relative abundance in western Kansas during July. Specimens in the Kansas State Agricultural College collection from Columbus, Ohio, bear a September label. The females enter the soil to oviposit and die soon afterward. Egg-laying occurs during June and July.

Egg.—The egg is oval in shape and nearly pearly-white in color. It is about 2 mm. long and 1.2 mm. wide when freshly laid. The eggs increase slightly in size with age and assume a more globose form until immediately preceding hatching, when they are about 2.5 mm. long and about 2 mm. wide. Hatching occurs early in July.

The following table shows the length of the egg stage as observed:

TABLE 1.—LENGTH OF EGG STAGE.

Date Laid 1919	Date Hatched 1919	Length of stage days	Date Laid 1919	Date Hatched 1919	Length of stage days
June 27	July 9	12	June 27	July 10	13
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	July 11	14
"	"	"	July 12	12	10
"	"	"	"	13	11
"	"	"	"	" "	11
"	July 10	13	"	" 14	12
"	"	"	"	" "	"
Average					12.2
Maximum					14.
Minimum					10.

Larva.—The larva resembles the common white grubs. No definite characters separate it from *Lachnosterna* grubs. There is, as in *Lachnosterna*, a triangular patch of hairs on the last ventral segment with a median double row of mesad pointing spines. The head is light brown or tan.

Before hatching the grub can be seen within the egg. When freshly hatched the head is white, except the tip of the mandible, but soon the whole head darkens to its characteristic color. Newly hatched larvæ are about 4 mm. long. As before stated, hatching occurs early in July, and the winter is passed in this stage. The following spring the prepupal condition is reached and pupation soon occurs. The length of the larval and prepupal stages of four individuals raised to maturity are shown in table 2.

TABLE II.—LENGTH OF LARVAL STAGE.

Egg Hatched	Became Preputa	Length of stage to prepupa days	pupated	Length of prepupal stage days	Length of complete larval stage days
July 7, '19	May 26, '20	321	June 2, '20	7	328
July 10, '19	May 26, '20	319	June 2, '20	8	327
July 10, '19	May 31, '20	325	June 6, '20	6	331
July 13, '19	May 25, '20	322	June 29, '20	4	326
Average		321.7		6.2	328
Maximum		325		8	331
Minimum		319		4	326

Pupa.—The pupæ are from 10 to 12 mm. long. When freshly transformed they are creamy-white but they gradually darken as the adult colors are assumed. The four grubs reared to pupation, as noted in table II, were likewise successfully reared to adults. Their period of pupal life is shown in table III.

TABLE III.—LENGTH OF PUPAL STAGE.

Date Pupated	Date Adult	Length of Pupal stage days
June 2, 1920	June 14, 1920	12
June 2, 1920	June 13, 1920	11
June 6, 1920	June 20, 1920	14
May 29, 1920	June 12, 1920	14
Average		12.7
Maximum		14
Minimum		11

SUMMARY.

The beetles of *Strigoderma arboricola* occur during May, June, and July. Egg-laying occurs in June and July. The eggs hatch in from 10 to 14 days, and the grubs pass the winter in the soil, requiring an average of 321.7 days to reach the prepupal condition which in turn requires 4 to 8 days, making an average combined larval stage of 328 days. The prepupal stage varies in length from 11 to 14 days with an average of 12.7 days. The four individuals reared to maturity, with their egg stages added, required 351, 352, and 358 days for complete development.

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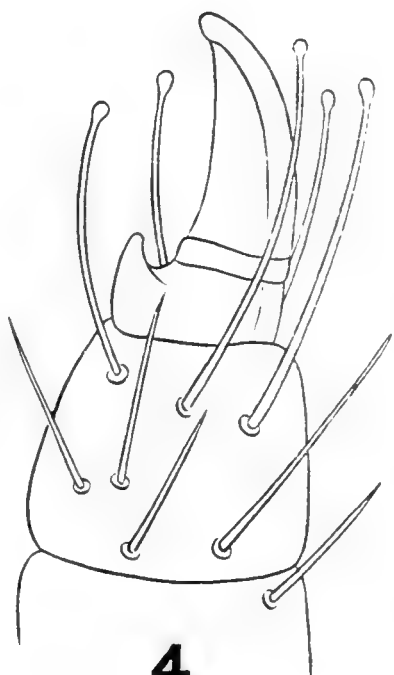
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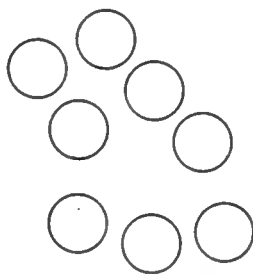
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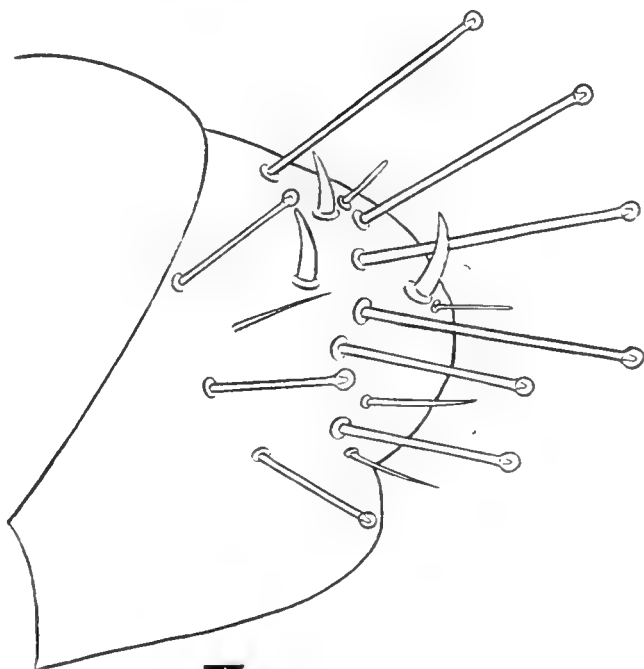
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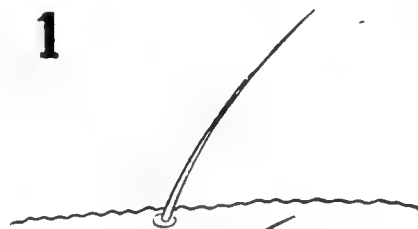
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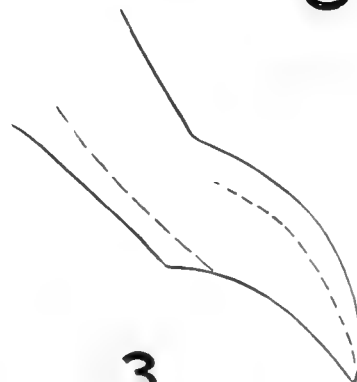
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A NEW SPECIES OF FRIESEA (COLLEMBOLA).

BY CHARLES MACNAMARA,

Arnprior, Ontario.

There are no such things as equinoctial gales. More of our old friends are gone. They have been sent by the meteorologists to try vainly of course—to blow William Tell's arrow from its mark or to flutter the Lincoln green cloak of Robin Hood, in that limbo of lost illusions where the moon controls the weather, and fixes the time when we should kill the pig; and where all the animals know if the snow is going to be deep next winter.

Therefore, although it occurred within a few days of the March equinox a couple of years ago, the gale that blew the top off a large maple in Elliott's sugar bush near Arnprior must be named without any qualification in respect of the time of year it happened. But it may be fairly recorded as an example of the proverbial ill wind; for if it blew Mr. Elliott no good in breaking the top off his tree, it led me to the always pleasing discovery of a new species.

The fallen top was about ten feet long by eight or ten inches in diameter. It had broken from a tree some 75 feet high, and its few stubby branches were smashed off in coming down. I chanced on it within twenty-four hours after it fell. The temperature was a little above freezing, but the day was raw and overcast, and there was still three or four inches of hard crusted snow on the ground. It was the moss on the bark that first attracted me. Moss means moisture, and moisture means springtails. It is strange how enormously standards of value differ. A dozy log with loose mossy bark is an absolutely worthless "dead cull" to a lumberman, while to a Collembolan hunter it is a delightful and valuable find. The bark on this log proved to be loose only in spots, but here and there under the flakes were considerable numbers of the white cast skins of Collembolans, an unfailing indication of the gregarious kinds, although as the skins may persist for several years, they are often present long after the colony that shed them has become extinct. But close examination with a magnifier presently discovered some very small slow pellid springtails, which I put down as a species of *Xenylla*; and young *Xenylla maritima* Tullb.—apparently about quarter grown—they turned out to be when I got them under the microscope at home that night. Not a very exciting capture this, as *X. maritima* is common under bark around here.

On a cold rainy day a week later I reached the sugar bush again; and although it had yielded nothing of interest before, somehow I gravitated to the fallen top once more. This time, besides a few additional specimens of the tiny *Xenyllans*, I captured half a dozen handsome olive-green *Isotoma determinata* MacG., another not infrequent bark dweller in my district. Then I found a single light grey Collembolan, small but strongly built, and further searching resulted in three more of them. They were all numb with the cold when I picked them up, but in the vial they livened up a bit, and began to walk around.

I did not recognize them for any springtail I knew, though they looked a little like an *Achorutes*. But determination of Collembola in the field is very uncertain, and two or three times my supposed prize has turned out to be only

another variety of the protean and ubiquitous *Achorutes armatus* Nic. So these unknown specimens I carried home without any great hopes.

And it was with no more than a mild curiosity that I prepared a specimen that evening for microscopical examination. The color that looks grey under the pocket magnifier is shown by the microscope to be a pale violet. Unguiculi are wanting, so the insect does not belong to the *Achorutes*, that genus being always provided with these little supplementary claws. A drop of potash solution is drawn under the cover-glass to clear up the pigment. The eyes can now be counted, and there are eight of them on each side, and no postantennal organs. Then suddenly interest flares up. *Three anal spines!* A hurried search in Guthrie and Folsom—this is a *Friesca*, and the only one of the genus ever recorded in North America before was described by Guthrie, who, finding it in a greenhouse, suggests that it is an exotic. My species does not fit Guthrie's description, and living at the top of a 75 foot maple in a locality that might almost be called the backwoods, it certainly cannot be anything but a native Canadian.

The next care was to get more specimens, and the following day I searched the fallen top for two hours and found two more; rate: one specimen per hour. The top was close to Mr. Elliott's sugar-house, and as he was making ready for the spring sap-boiling, I was afraid he might cut up my precious log for fuel, so I asked him to spare it. He readily agreed, albeit with an indulgent smile that might greet the naive request of a child or a slightly demented person. But my precautions were unnecessary, for I completely unbarked the log without finding a single additional specimen on it.

I searched also in vain the trunk of the tree from which the top had fallen and many other trees around. They yielded numerous other Collombolans but no more Frieseans.

Nor did I find any more anywhere else all summer, although I looked for them in all kinds of places, likely and unlikely. It was not until late in the autumn that they came into my life again; and strange to say, they were again found in a fallen maple top. On the 26th October fate led me through a hardwood grove 300 or 400 yards to the east of the sugar-bush of original discovery. There I noticed a maple lately broken off about 40 feet up, and the 15 or 20 foot top, with its butt on the ground was standing upright against another tree. The nice loose-looking bark of the broken piece appealed to me, and I began to pry pieces off, and examine them with my watchmaker's glass. Almost immediately I saw my *Friesca* again. This time they were gathered in groups of five or six, and many individuals were much larger than any of those I had taken in the spring. In the course of the next few days, before all the loose bark was removed, I collected here with delight 30 or 40 good specimens. After the poverty of six small individuals that I had suffered from before, this was affluence, and should have contented me. But no collector is ever really satisfied. There is no wealth beyond the dreams of avarice, and I felt like John D. Rockefeller when he had saved his first ten millions.

And so the quest of the *Friesca* continued. Numerically, the subsequent results have been poor, only two specimens having been collected during the past year. But the remarkable feature of this, the third separate discovery of

the species, was that the insects were again disclosed living at the top of a maple tree. The two specimens were taken from under the bark of a short thick branch, lately fallen, like the first broken top, from the summit of a large maple in Elliott's sugar-bush.

In each instance the conditions under which the insects were found precluded any chance of their having made their way from the ground onto the fallen piece after it had come down. They had certainly been living in the tops of the trees. Of course, numerous Collembolans live all over trees from root to crown wherever there may be a little moisture or rotten wood; but this species appears to live in the tops only. However, I can see no good reason why this should be their only habitat, and it is probable that eventually they will be found in lowlier stations.

As appropriate to their apparent predilection for high places, the species is named "sublimis", the word—which was kindly suggested to me by Mr. F. J. A. Morris of Peterborough—being used in its primitive sense of "raised up."

The genus *Friesea* Dalla Torre comprises only five described species including the subject of this paper. The discovery of the present species necessitates a few changes in the generic description which should now read as follows:

Genus *Friesea* Dalla Torre

Eyes eight on each side as a rule; five on each side in *F. decemoculata* Börner. Postantennal organs absent. Antennae four-segmented. Mandible without molar surface. Head of maxilla simple. Unguiculi absent. Furcula short, weakly developed in most species; well developed in some species; mucro hooklike. Anal spines three. Anal segment small; supra-anal valve rounded semi-globose. Body without segmental tubercles, cuticula tuberculate.

Friesea sublimis, n. sp.

Color, pale lilac on silvery white ground, the head being slightly darker than the body; under parts lighter and body sutures white. *Eyes*, (fig. 1) eight on each side. No postantennal organ. *Antennae* (fig. 2) subconical, three-quarters length of head; third and fourth segments confluent dorsally but suture shows ventrally; fourth segment with five or six thick curved olfactory setae as well as many straight, tapering hairs; stout capitate protusible sense organ in a deep pit on apex just inside median line, another sense organ of two thick hooked members distally in a recess on outer side of third segment. *Maxilla* (fig. 3) with simple head and acute apex. *Mandible* with several distal inner incisive teeth and no molar surface. *Unguis* (fig. 4) stout, curving, untoothed; unguiculus represented by a rounded lobe only; front feet usually with four knobbed tenent hairs, and mid and hind feet with five such hairs, but sometimes the hairs immediately above these are knobbed also making a total of six, seven or eight tenent hairs; tibiotarsus with a distal subsegment. *Furcula* (fig. 5) not rudimentary, but short, not reaching to second abdominal segment; dentes not reduced, stout, with three dorsal setae; mucro one quarter length of dens, with strong apical hook and prominent rounded lamella. *Tenaculum* bidentate,

in outline as fig. 6. *Anal spines*, (fig. 7) three in a triangle, with proximal base and distal apex, slightly curved, sharp, three-fifths length of hind ungues, on low papillae. The anal and genital segments bear many long straight setae with conspicuous round heads, and a few simple setae interspersed. *Clothing* (fig. 8) a few short curving setae. *Integument* finely tuberculate. Maximum length, 1 mm. Found under bark, April and October, near Arnprior, Ontario.

Compared with the powerful springing apparatus of an expert leaper like *Isotoma palustris* Mull., the furcula of *Friesea sublimis* appears small and weak. Nevertheless it is much better developed than in any other known member of the genus, and it is that that chiefly distinguishes the new species. The furculas of all other described Frieseans are little more than rudimentary, but with *F. sublimis*, though short, it is actually functional, and I have seen them leaping a distance of two or three inches, though they seldom indulge in the practice. The maxilla as shown in fig. 3 is a conspicuous object in the head when the specimen is depigmented.

As usual, I am much indebted to Dr. J. W. Folson of the University of Illinois for advice and assistance in describing this species.

EXPLANATION OF PLATE V.

- Fig. 1. Eyes of left side, x 600
2. Left antenna, x 1200
3. Maxilla, x 900
4. Left hind foot, x 1500
5. Dens and mucro, x 1000
6. Tenaculum in outline x 1500
7. Anal segment showing spines and capitate setae, x 800
8. Clothing of first abdominal segment, x 1000

MISCELLANEOUS STUDIES IN THE COLEOPTERA— NO. 1.

BY FRANK E. BLAISDELL, SR.

Stanford University, Calif.

The following new species and races of American Coleoptera were found among a number of other species recently submitted to me for identification.

Listrus provincialis, New Species

Form oblong-ovate, about three times as long as wide and slightly robust.

Colour black; mouth-parts, antennae and tarsi more or less piceous; second antennal joint frequently paler.

Pubescence moderate in length, recumbent, linear and subsquamiform, quite dense and argenteo-plumbeous to luteo-cinereous in colour. Dark hairs arranged as follows: basal parascutellar and humeral macules very small or obsolete; post-basal macule at middle of each elytron, small and irregularly rounded; a rather slender transverse submedian fascia slightly behind the middle, zig-zag, and scarcely attaining the lateral margin or suture; subapical fascia similar or broken into two macules on each elytron; apical macules very feebly indicated or obsolete. Median pronotal macule more or less broken into four parts, two small anterior dots and two larger and slightly elongate, posterior dots; lateral

semilunar vittae feeble or more or less obsolete, sometimes represented by a small rounded macule; central area of the frons slightly darker.

Head subquadrate, moderate in size, broadly and very feebly impressed between the eyes, densely indentato-punctate, with a small rounded, glabrous convexity opposite the middle of the base of the clypeus. Eyes moderately large, and rather prominent, quite broadly convex and entire. Antennae similar in the sexes, extending to about one joint beyond the pronotal base; rather stout, outer joints moderately compressed, second oval and not stout, about as wide as long, third cylindro-obconical, about twice as long as wide, fourth as long as wide, subtriangular, fifth distinctly wider than the preceding and slightly wider than the three following joints, a little longer than wide and subtriangular; succeeding joints scarcely serrate anteriorly, sixth to the eighth subequal in size, triangular, anterior angle more obtuse than that of the fifth, ninth a little larger and stouter, obtusely rounded anteriorly, triangular, scarcely transverse, tenth still wider, slightly transverse and triangular, eleventh obovate, about twice as long as wide and compressed at apex.

Pronotum about a fourth wider than long, rather strongly and evenly convex from side to side; apex broadly and feebly arcuate in circular arc; sides quite broadly arcuate in basal two-thirds, thence feebly convergent to apex, more abruptly so at base, the latter broadly and not strongly arcuate, distinctly sinuate laterally into the rounded or obtuse basal angles; apical angles rounded; disk densely indentato-punctate, laterally indentato-punctato-reticulate. Lateral fimbriae moderate in length and backwardly curved; serrulations small and unequal in size.

Elytra oblong, rather parabolically rounded at apex, a little more than twice as long as wide; feebly convex at the disk, rather strongly so laterally; punctures rather close, somewhat coarse, separated by a distance equal to about twice their diameter; surface more or less granulato-reticulate, punctures somewhat impressed, intervals almost transversely prominent; humeri not at all prominent, rounded and obtusely rectangular.

Abdomen densely and finely reticulato-punctulate, fifth segment more strongly so. Apex of abdomen rather densely clothed with moderately long brownish or blackish hairs in both sexes.

Legs moderate in stoutness and length.

Male.—rather more oblong and less arcuate at the sides; fifth ventral segment truncate and distinctly sinuate at apex but not deeply so.

Female.—More ovate, sides more arcuate; fifth ventral rather strongly rounded at apex.

Measurements.—Length, 2.8-3 mm.; width, 1-1.1 mm.

Holotype, male, and *allotype*, female, to be deposited in the National Collection at Ottawa. *Paratypes* in the collection of Mr. Ralph Hopping and that of the author.

Type locality.—Spious Creek, near Merritt, B. C. Collected on May 23rd, 1920. Mr. Hopping has also taken it at Midday Creek, B. C., collected July 13th, 1920.

I cannot consider that Casey's *Listrus plenus*, taken on Vancouver Island, is the same as the present species for the following reasons: In *plenus* (female)

the antennae are slender, pronotal disk deeply and very closely perforato-punctate, interstices narrow, sparsely and feebly punctulate; pubescence denuded in *large irregular areas* on the elytra. In *provincialis* the antennae are moderately stout, pronotal disk densely indentato-punctate, intervals mere lines between the punctures and indentations, and finally the elytral dark pubescent areas are in well defined *small macules* or macules and narrow fasciae.

Eleodes (Litheleodes) extricata var. utahensis n. var.

Form fusiform-ovate to ovate, moderately strongly convex. Colour black, dull in lustre and alutaceous; surface smooth and the sculpturing feeble.

Head and pronotum finely punctulate, rather densely so on the frons. Antennae rather slender.

Pronotum slightly wider than long, evenly convex, punctures not denser laterally; apex truncato-sinuate in circular arc, angles subacute and somewhat prominent anteriorly; sides broadly and about equally arcuate from apex to base, marginal bead very fine; basal angles obtusely rounded; base broadly arcuate; apex and base almost equal in width.

Elytra oval, base broadly and feebly sinuate, scarcely wider than the contiguous base of the pronotum; humeri subacute, not at all prominent nor exposed; sides broadly and evenly arcuate to apex, gradually oblique to the obtuse apex; disk moderately convex, rather broadly arcuate laterally into the somewhat inflexed portion; punctures fine in closely placed longitudinal series, more or less confused laterally and on the inflexed sides and apical declivity.

Abdomen feebly and sparsely punctulate; obsoletely rugulose on first two segments.

Legs moderately long and rather slender.

Male.—Narrower. Anterior femora with an obtuse salient. Abdomen moderately convex and horizontal. Anterior tarsi without tufts of pubescence on the first joint at tip beneath, plantar grooves open on all the joints.

Female.—Broader, ovate. Abdomen rather strongly convex.

Measurements.—Length, (types), 16.5-16 mm.; width, 5.3-6.0 mm.

Holotype, female, and *allotype*, male, in the author's collection; *paratypes* in that of Mr. Warren Knaus.

Type locality.—Milford, Utah. Collected by Mr. Warren Knaus at an elevation of 4900 feet, on June 29th, 1919.

The differential characters are, the dull alutaceous lustre, smooth surface, fine inconspicuous punctuation and slender antennae. In typical *extricata* Say, also in the race *cognata* Hald., the plantar groove on the first joint of the anterior tarsi is closed at tip by a small tuft of golden pubescence. This tuft is absent in the male of *utahensis*. The latter race should precede the race *cognata* in our lists.

Eleodes (Litheleodes) vandykei variety modificata n. var.

Similar to *vandykei*, except that the elytra are moderately coarsely muricato-rugose throughout, with intermixed punctures. Form rather more ovate than in *vandykei*. Recent studies have lead irresistably to the conclusion that *vandykei* is a distinct species and not a race of *litcheri* Blais.

Measurements.—(Male and female). Length, 14-14.5 mm.; width, 6-7.3 mm.

Holotype, male, and *allotype*, female, to be placed in the National Collection at Ottawa. *Paratypes* in the collection of Mr. Ralph Hopping and that of the author.

Type locality.—Vernon, B. C. Collected April 6th, 1920, by Mr. Ralph Hopping. The elytral sculpturing in *modificata* is almost like that seen in *Eleodes cuneaticollis* Casey.

The following tabulation of characters will help in the recognition of *letcheri* and *vandykei* with its races:

- | | |
|--|------------------------------|
| Elytra muricately punctate..... | 1 |
| Elytra more or less muricato-granulate..... | 3 |
| 1. Elytra sparsely pubescent with rather long flying hairs..... | <i>letcheri</i> Blais |
| . Elytra with short setae..... | 2. |
| 2. Elytra densely and muricately punctured, minutely so on the
dorsum | <i>vandykei</i> Blais. |
| - . Elytra densely and moderately strongly muricato-rugose with intermixed
punctures | var. <i>modificata</i> n. v. |
| 3. Size usually smaller, pronotum relatively smaller and quadrate;
granules subtuberculate and more or less arranged in
evident longitudinal series..... | var. <i>parvula</i> Blais. |

In *parvula* the pronotum is noticeably smaller, more quadrate, with the sides less arcuate and parallel.

The species of the subgenus *Lithelcodes* may be arranged in the following sequence:

Eleodes (*Lithelcodes*) *arcuata* Casey.

extricata Say.

Var. *convexicollis* Blais.

var. *utahensis*, new variety.

var. *cognata* Hald.

var. *arizonensis* Blais.

granulata Lec.

var. *obtusa* Lec.

var. *corvina* Blais.

papillosa Blais.

letcheri Blais.

vandykei Blais.

var. *parvula* Blais.

var. *modificata* Blais.

NEW NEARCTIC CRANE-FLIES (TIPULIDAE, DIPTERA). PART XI.

BY CHARLES P. ALEXANDER,

The types are preserved in the collection of the writer unless stated otherwise. The material from Idaho is preserved in alcohol; paratypes of certain of these species are placed in the collection of the United States National Museum at the request of Mr. Shannon.

Limnophila (*Idioptera*) *shannoni*, new species

General coloration (in alcohol) dark brown; coxae and trochanters light

yellow; wings greyish yellow, the cross veins and deflections conspicuously seamed with greyish brown; male hypopygium with the outer pleural appendage simple.

Male.—Length about 6.5 mm.; wing 8 mm.

Female.—Length 7.8 mm.; wing 8.4 mm.

Described from alcoholic material.

Rostrum and palpi dark brown. Antennae of the male long, if bent backward extending about to the base of the abdomen; scapal segments pale yellowish brown, the flagellum dark brown. Head dark brown, the genae paler.

Thorax dark brown, with no stripes evident in alcoholic material. Halteres pale, the knobs a little darker. Legs with the coxae and trochanters light yellow; femora yellow, broadly tipped with dark brown; tibiae brownish yellow; tarsi pale brown. Wings with a faint greyish yellow tinge, the wing-base and the costal and subcostal cells more yellowish; stigma oval, dark brown; conspicuous greyish brown seams at the origin of R_R ; at Sc_2 ; along the cord and outer end of cell 1st M_2 and along the supernumerary crossveins; veins dark brown. Venation: Sc_2 some distance from the tip of Sc_1 , this distance slightly variable; R_1 bent caudad at R which is inserted on R_2 a little more than its own length beyond the fork and on R_1 about its length from the tip; R spurred at origin, in alignment with $R_2 + 3$; basal deflection of $R_4 + 5$ and R in oblique alignment; petiole of cell M_1 much shorter than this cell; basal deflection of Cu slightly before midlength of cell 1st M_2 .

Abdomen dark brown. Male hypopygium with the pleurites stout; two pleural appendages, the outer appendage simple, narrow at the base, gradually widened to the squarely truncated apex, the outer margin and apex provided with numerous small appressed spines; inner pleural appendage a little longer than the outer, gradually narrowed to the bluntly rounded apex, the surface provided with setae.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Allotopotype, ♀.

Paratopotypes, 1 ♂, 1 ♀, the latter teneral.

This species and the next are of very considerable interest as being the first American representatives of the group typified by *L. (I.) trimaculata* (Zett.) of northern Europe. The genitalia are of a structure that differs in several respects from that of the type of the subgenus *Idioptera*, however, and it may be that all these species are not true members of *Idioptera*. It is with great pleasure that this interesting fly is dedicated to Mr. Shannon as an appreciation of his kind help in collecting Tipulidae in various parts of the United States.

***Limnophila (Idioptera) bifida*, new species.**

General coloration (in alcohol) brownish black; coxae and trochanters obscure yellow; wings dusky grey, the stigma slightly darker; no distinct darker markings on the wing; male hypopygium with the outer pleural appendage profoundly bifid.

Male.—Length about 5 mm.; wing 6 mm.

Female.—Length about 6.5 mm.; wing 6.7 mm.

Described from alcoholic material.

Head, rostrum and palpi brownish black. Antennae brownish black, the distal segments a little paler, if bent backward extending to (♀) or beyond (♂) the wing-root; flagellar segments in the ♂ rather elongate.

Mesonotum and pleura dark brown, the dorso-pleural membranes paler. Halteres elongate, pale, the knobs slightly darker. Legs with the coxae and trochanters obscure yellow; remainder of the legs light brown, the tips of the femora and tibiae slightly darker. Wings with a strong dusky grey tinge; wing-base slightly yellowish; stigma oval, darker grey; exceedingly faint markings at the origin of R_1 and along the cord; veins dark brown. Venation: S_{C1} long, S_{C1} extending to about four-fifths the long R_s , S_{C2} removed a short distance from the tip of S_{C1} ; R_s long, strongly arcuated at origin, in alignment with $R_2 + 3$; $R_2 + 4$ rather long, about twice the deflection of $R_2 + 5$; very faint; veins R_2 and R_3 divergent; cell R_2 at the margin wider than either cells 2nd R_1 or R_3 ; petiole of cell M_1 about as long as the cell; basal deflection of Cu_1 at about one-third the length of cell 1st M_2 ; supernumerary crossvein in cell M a short distance beyond the origin of R_s .

Abdomen dark brownish black. Male hypopygium with the ninth tergite bifid, the lobes narrowly rounded at their tips and provided with blackened spines; pleurites short and stout, the apex of each produced into a flattened lobe; outer pleural appendage very broad, profoundly bifid, the dorsal blade flattened, with the inner margin provided with four or five appressed acute teeth; the ventral blade is narrower, a little shorter, at the tip with a few acute erect spinules; inner pleural appendage flattened, very short and high, rapidly narrowed to the blunt apex, provided with numerous setae. Ovipositor long and slender, the tergal valves upcurved, horn-color.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Allotopotype, ♀.

***Rhaphidolabis (Rhaphidolabis) subsessilis*, new species.**

General coloration (in alcohol) brownish yellow, the praescutum with a conspicuous dark brown stripe; antennae with twelve segments; wings subhyaline; stigma faintly darkened; cell R_3 sessile or subsessile; abdomen dark brown.

Male.—Length about 5.2 mm.; wing 6.7 mm.

Female.—Length about 6.5 mm.; wing 7.4 mm.

Described from alcoholic material.

Rostrum and palpi brown. Antennae with twelve segments, dark brown, the last segment one-half longer than the penultimate. Head dark brown.

Pronotum obscure brownish yellow, broadly dark brown medially. Mesonotum brownish yellow, the praescutum with a conspicuous median dark brown stripe that is narrowed behind, ending before the suture; lateral stripes very indistinct. Pleura brownish yellow. Halteres pale, the stem darker. Legs with the coxae and trochanters brownish yellow; remainder of the legs brown, the tarsal segments darker. Wings subhyaline, iridescent, the stigmal area faintly brownish; veins dark brown. Venation: R_1 moderately elongated, strongly arcuated; cell R_3 sessile to very short petiolate; outer deflection of R_2 less than its own length from the tip of R_1 ; cell 1st M_2 open; cell M_1 present, the branches

that enclose it widely divergent.

Abdomen dark brown, paler laterally. Male hypopygium with the distal lateral angles of the pleurite provided with numerous blackened spines; proximal face of pleurites with long, erect bristles; two pleural appendages, these short and stout, approximately equal in size, the outermost clavate, the head with numerous black spicules; inner appendage pale, the apex broadly and obtusely rounded. Lateral gonapophyses long and slender, approximately as long as the pleurites themselves.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Allotopotype, ♀.

Rhaphidolabis *subsessilis* is closely related to *R. rubescens* Alex. (North-eastern North America) but is readily told by the presence of but twelve antennal segments, the coloration and the elongate lateral gonapophyses of the male hypopygium. In its general appearance it is more like *R. major* Alex. (Colorado), a very different fly.

***Rhaphilolabis (Plectromyia) reducta*, new species.**

General coloration (in alcohol) pale brownish yellow, the praescutum indistinctly darker medially; antennae with only eleven segments; wings hyaline, the stigma lacking; cell R_3 petiolate; abdomen with a subterminal darker brown ring.

Male.—Length 4.2 mm.; wing 5 mm.

Described from alcoholic material.

Rostrum obscure yellow; palpi short, brown. Antennae brown, the basal segment paler; flagellum with only nine segments; flagellar segments long-oval, gradually decreasing in size to the end. Head yellowish brown.

Mesonotum pale brownish yellow, the praescutum indistinctly darker medially; scutal lobes slightly darkened. Pleura yellow. Halteres pale, the knobs brown. Legs with the coxae and trochanters light yellow; remainder of the legs pale brown, the tibiae a little darkened at the tips. Wings hyaline; stigma lacking; veins brown. Venation: R^S comparatively short, strongly arcuated; petiole of cell R_3 long, subequal to the basal deflection of R_4 ; outer deflection of R_2 perpendicular or nearly so, close to the tip of R_1 ; cell M_1 lacking, as in the subgenus, petiole of cell M_3 longer than this cell; basal deflection of Cu_1 a short distance beyond the fork of M , very faint, without macrotrichiae.

Abdominal tergites light brown; sternites more yellowish; segments seven and eight dark brown. Male hypopygium with the pleural appendages short, stout, the tips blunt; one appendage is more slender, near the tip provides with several spinous setae, the other appendage very short and stout with the distal and blunt, set with several short spines and about two long, delicate bristles.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Paratopotype, ♂.

This small fly presents an appearance that is very similar to the type of the subgenus *Plectromyia* except that the cell R_3 is petiolate. The reduction in number of antennal segment is very interesting and difficult of explanation. Within the group *Dicranotae* there is now found a range of from eleven to

fifteen antennal segments (11 in *Rhaphidolabis reducta*; 12 in *Rhaphidolabis subsessiles*, and *Dicranota nipponica*; 13, the normal number for the group; 14 in *Rhaphidolabis flavibasis*; 15 in *Rhaphidolabis fascipennis* and other Oriental species).

***Dicranota rogersi*, new species.**

General coloration gray; mesonotal praescutum with three broad dark brown stripes; antennae of male elongate; wings faintly tinged with brown; stigma dark brown; a paler brown seam along the cord; cell M_1 normally present; cell 1st M_2 open by the atrophy of m . male hypopygium with two subequal pleural appendages; the chitinized blade at base of pleurite with the stem less elongate than in *D. eucera*.

Male.—Length about 5.8 mm.; wing 6.6—7.5 mm.

Female.—Length about 7.5 mm.; wing 9.3 mm.

Rostrum brown, grayish pruinose. Antennae with 13 segments, in the male very long, if bent backward extending nearly to the base of the third abdominal segment; first scapal segment obscure reddish; remainder of antennae dark brown; flagellar segments elongate cylindrical. Head dark brown, the vertex adjoining the eyes broadly yellowish gray.

Mesonotal praescutum with a yellowish gray pollen, with three conspicuous dark brown stripes, the broad median stripe very indistinctly split anteriorly by a capillary pale line; interspaces with erect yellow setae; scutum yellowish gray, the centers of the lobes dark brown; scutellum and postnotum light gray. Pleura gray. Halteres pale, the knobs slightly darkened. Legs with the coxae pale, with a sparse grayish pollen; trochanters obscure yellow; femora dark brown, yellowish basally; remainder of legs dark brown. Wings faintly infuscated; stigma conspicuous, dark brown, occupying cell 2nd R_1 and the distal end of cell Sc_1 ; paler brown seams along the cord and at the origin of R_s ; veins dark brown. Venation: S_C long, extending to slightly beyond r ; S_C far before fork of R_+ , the distance a little greater than that section of S_C beyond R_s ; R_s moderately long, angulated at origin; $R_1 + 1$ about equal to the deflection of R_2 ; r rather indistinct; R_2 less than its own length from the tip of R_1 , entirely provided with macrotrichiae; cell M_1 present in normal individuals; cell 1st M_2 open by the atrophy of m ; petiole of cell M_2 a little shorter than the cell; basal deflection of Cu_1 about one-half its length beyond the fork of M .

Abdominal tergites brown, with about the posterior half of each segment paler brown; sterites a little paler than the tergites. Male hypopygium with the pleurites short and stout, the caudal lateral angle produced into a short, blunt lobe; two sub-equal pleural appendages; outer appendage fleshy, provided with several long setae; inner appendage subchitinized, with a patch of long, erect setae on the proximal face at the base and a group of short setae on the outer face near the tip: at base of pleurite a chitinized blade that is produced into a beak-like structure with the point directed laterad.

Habitat.—Michigan.

Holotype, , Gogebic County, August 17, 1920 (J. S. Rogers).

Allotopotype, ♀.

Paratopotypes, 8 ♂♀.

Type in the Collection of the Museum of Zoology, University of Michigan.

Dicranota rogersi is named in honor of my friend, the collector, Mr. J. Speed Rogers. It is most closely allied to *D. eucera* O. S., in the elongate antennae of the male sex. From this species it differs in the normal presence of cell M_1 , the dark stigma and the details of structure of the male hypopygium, as the subequal pleurites.

A NEW PAPAPEMA FROM DELAWARE (Lepidoptera, Noctuidae)

BY HENRY BIRD AND FRANK MORTON JONES.

(PLATE VI)

Although a collecting trip through peninsular Delaware and Maryland in July 1920 did not have the genus *Papaipema* as its primary object, the possibility of turning up interesting material in this group was well in mind, so that when our car stopped in a promising bit of low woodland along the DuPont Boulevard, a dried stalk in the roadside herbage attracted immediate attention. Investigation showed it to be not one of the recognized food plants of the group, and as the contained larva was not of that almost ubiquitous species, *cataphracta*, a vigorous search was begun for more. In half an hour, more than thirty infested branches had been gathered, and it was apparent that we were dealing with a species whose life history had been unrecorded, and which possibly was new to science. All this was done at very considerable expense to clothing and bodily comfort for the foodplant is that thorniest inhabitant of our woods, *Aralia spinosa*, which as a small tree along the edges of woods and in thickets bordering woodland streams, with its great frond-like leaves and immense flower-panicles, is a conspicuous feature of the flora of southern Delaware. We had too, the unique experience of gathering *Papaipema* larvae from high over our heads, instead of grubbing them out of root-stocks or the fleshy stems of perennial herbs. The tunnels of this insect, in the thick branches of *Aralia*, are of large diameter, beginning at or near the terminal bud and extending downward through the pithy annual growth, often into the older wood below; gummy exudations mixed with blackened frass mark the entrance to the burrow, and the terminal shoot usually dies and shrivels, a hanging cluster of dead leaves often further advertising its location; adventitious shoots from below the point of injury sometimes bear stunted flower-panicles.

In our breeding-cages, pupation occurred more frequently in the larval burrows, rather than in the ground, and another trip was made in early September, in the full expectation that pupae would be found in abundance. Dozens of the typical burrows in the branches of *Aralia* were found, but not one of them contained either larva or pupa, and we were forced to conclude that under natural conditions pupation takes place in the soil, not in the branch of the foodplant. A tabulation of our eastern species of the genus, together with the large size of the *Aralia*-feeding larvae, indicated Dyar's *nephrosyntheta* as the probable identity of our find; but the emergence of the first moth showed that we had, not the anticipated *nephrosyntheta*, but an undescribed species. In this genus, where foodplant association has apparently been a prime factor in the differentiation of so many closely related species, a name derived from that of the foodplant is especially appropriate, and we therefore propose for this insect the name,

***Papaipema araliae* n. sp.**

Head smooth on fons, antenna simple (minutely ciliate under magnific-

ation) with little sexual disparity and set in a tufting of whitish scales. Thoracic vestiture yellow overlaid by longer, purple-brown scales, the prominent anterior tuft has the long purple scales predominant, the yellow standing out strongly on the tegulae and dorsal area, here margined with purple.

Primary proportionately broad, of the typical maculation; the chrome yellow ground color is overlaid and much obscured with purple-or reddish-brown powderings, deepest on the veins and productive of a rather tawny effect. At the extreme base a dot of yellow or whitish scales, the basal spot is yellow, the basal line double, from which outwardly a yellow *dot* appears on the median vein; the basal area remaining appears as an irregular purplish band, bounded outwardly by the sinuous, double, antemedial line; the median field is evenly and entirely of one shade of yellow, upon which the powderings appear more dense in individual cases; the median shade line is prominently drawn in brown, angles at the lower corner of reniform and has a course thence straight to the inner margin, with a tendency to be denticulate between the veins. The orbicular is a rounded white spot, dotted or cut centrally with a few yellow scales; the claviform is composed of two smaller spots, with the upper minute and either white or stained with yellow, and the lower one pure white. The reniform is the usual combination of broken spots, mostly yellow but with some white appearing in varying degree. The post-medial line is double, excurved past the reniform, thence nearly straight to inner margin. Sub-terminal area glistening purplish, defined from the terminal space by the very denticulate sub-terminal line, and the latter area more yellowish especially at the apex where the bright yellow ground again shows. Fringes are lustrous purple-brown.

Secondary is of a much paler yellow, more or less suffused with a rosy flush, a faint median line and sub-terminal banding appearing in darker tone; the fringes paler than primary. The undersides of all wings are of similar hue to the secondary, a median line appears and stipplings of purple-brown are densest on costal margins. The abdomen is of same colour as secondaries, the usual tuftings appearing. Normal expanse, 38 to 45 mm.

The genitalic structures of the male conform to the conventional pattern, being similar to *marginidens* and others in detail. The trigonate, spinose area of the cost has the lower angle produced into a long point (called the pollex by Pierce) and this exceeds the curved, thorn-like harpe, which has the usual array of fine teeth posteriorly.

Five males and three females are under examination; one male type and One dwarfed example not fully typical. Emergence for the series, Sept. 24 to 30, 1920.

Type locality, Sussex County, Delaware.

The larval habit evidently conforms to the usual happenings in the genus; the hibernated egg doubtless gives up its larva the latter part of May, the growth proceeding as with allied species.

Larva. Penultimate stage: Belong to that section of the genus where the first four abdominal segments appear as a dark girdle, with the continuous dorsal and sub-dorsal lines broad and well defined in yellowish white, except where the latter are broken at the girdle, this species might be well selected as typifying what *Papaipema* attains in its best showing of tubercle arrangement and the attributes of its congeners.



1



2



3



4

PAPAIPEMA ARALIAE, NEW SPECIES
(See Page 137)

Fully normal upon all points, its individuality is yet shown in the uniformity and large size of tubercle I on all abdominal segments. This is about three times the size of a spiracle and equals IV, ordinarily the largest general plate. On joint ten, the evanescent IVa becomes the largest lateral plate of the five here surrounding the spiracle. The anal plate is normal, brown.

Last stage: More of the early colouring is retained at this time than usual, the dull pinkish ground colour giving definition to the, pale yellowish lines, which remain as before. Head shining brown, with blackish shade at ocelli; width, 3.25 mm. Body robust smooth, cylindric, livid; setae weak. On joint one the cervical shield is wider than head and is margined with black laterally. On joints four, five and six tubercle I is reduced; on ten the same arrangement holds as formerly, and all tubercles are indicated by blackish plates. The spiracle on joint eleven is not enlarged, as it is with the fern feeders. Lengths, 52 and 56 mm. for the stages respectively.

The pupa is correspondingly robust, shining brown and active; there is no frontal development and the cremaster consists of two separate and slightly divergent, curved hooks. The transformation is made in the ground after a rather lethargic resting period, the date of leaving the burrow being from Aug. 10 to 25, so far as could be determined.

A Tachinid fly claimed a large percentage of the observed larvæ, and doubtless is a regular check in this case, as with others. It seems to be, according to Dr. J. M. Aldrich, *Masicera seniles* Ms.

With the full evidence at hand there is no question as to the standing of this as a distinct species. There is, however, the question yet open as to what one of the species Guenee's type of *rutila* may finally fit in with. Drawings of that type indicate a narrow winged, yellow form, with brightly white stigmata, and there seems no fear of duplication in the case of *aralix*. Serial position near *merriccata* and *arctivorens* may be accorded it.

Our specimens of *araliae* were collected in the woodlands bordering the DuPont Bouvelard, beginning about two miles south of Ellendale, thence southward wherever the foodplant occurs in abundance, for a distance of about fifteen miles. The wide southern and western distribution of the foodplant (Pennsylvania to Florida and Texas) makes it probable that the associated insect, may also prove to be a widely distributed species with a range possibly approximately that of the plant.

EXPLANATION OF PLATE VI.

- Fig. 1—*Papaipema araliae*, penultimate stage larva.
 2—*Papaipema araliae*, mature larva.
 3—*Papaipema araliae*, male.
 4—*Papaipema araliae*, female.

A REVISION OF THE CANADIAN SPECIES OF THE AFFINIS GROUP OF THE GENUS *TABANUS* (DIPTERA).

BY J. MCDUNNOUGH, PH.D.
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In connection with the preparation of a complete list of Canadian species of the genus *Tabanus* it became necessary to revise thoroughly the existing iden-

*Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

tifications in the Canadian National Collection. It soon was evident that in the *affinis* group, which is essentially a northern one, there were a number of closely allied forms, capable apparently of separation on structural details of palpi, antennae, etc., which heretofore had been lumped under a single specific name.

In anticipation of a more extended work on the entire genus and with a view to clearing up the various nomenclatorial tangles in the group, I offer the following notes on the various Canadian species, accompanied by a key, based on a study of the structural characters of the females only. Owing to the relative scarcity of the males and the difficulty of definitely associating them with the correct females I am unable at the present time to give satisfactory characters for this sex. I have been in constant correspondence with Prof. Jas. Hine in regard to the correct application of many of our older names and I am pleased to state that in every instance we agree as to the species to which such names should be applied. Miss G. Ricardo has also compared for me a good deal of material with Walker's types in the British Museum and thus enabled me to definitely place several of his heretofore unrecognized species. To both these workers my hearty thanks is due. I am also greatly indebted to Mr. E. P. Vanduzee, San Francisco, Calif., Prof. A. L. Lovett, Corvallis, Oreg., Prof. R. A. Cooley, Bozeman, Mont. and Mr. J. B. Wallis, Winnipeg, Man. for loan of material.

The *affinis* group, as understood in the present paper, comprises those species in which the greater part of the first four abdominal segments is red or orange-red of various shades with a varyingly broad blackish dorsal band. The species extend across the entire northern half of the American continent reaching southward along the Atlantic Coast, down the Rocky Mountains and through the Cascades to the Sierra Nevada Mts. Further collection, especially in British Columbia will probably increase the number of known species; at the present time I am able to differentiate thirteen species.

KEY TO SPECIES.

FEMALES.

- 1. Abdomen with 1st segment laterally orange or reddish.....2
- Abdomen with 1st segment laterally black.....12
- 2. Wings with all cross-veins distinctly clouded with brown
-*lasiophthalmus* Macq.
- Wings unclouded or with only bifurcation of third vein clouded.....3
- 3. Palpi thin, not swollen at base of 2nd joint.....4
- Palpi shorter, with base of 2nd joint noticeably thickened.....9
- 4. Subcallus normally denuded; front very broad.....*captonis* Mart.
- Subcallus normally not denuded.....5
- 5. Small species, 10 mm., very thin palpi, antennae with 3rd joint scarcely excavated basally.....*minusculus* Hine.
- Larger species, 14mm., or over.....6
- 6. Large species, 17-19mm; antennae with 3rd joint very strongly excavated basally7
- Smaller species, 14-17mm; antennae only moderately excavated at base..8
- 7. Palpi deep orange-yellow; abdomen laterally deep orange-red..*affinis* Kby

- Palpi paler; abdomen laterally yellow-brown.....*californicus* Mart.
8. Palpi long and thin, deep orange; length 14-15mm.; basal portion of third antennal joint chunky.....*trepidus* McD.
Palpi shorter and thicker, pale creamy; length 15-17mm.; basal portion of 3rd antennal joint rather slender.....*haemaphorus* Mart.
9. Subcallus normally denuded; palpi chunky, pale creamy.....*nudus* McD.
Subcallus not normally denuded.....10
10. Antennae red with third joint moderately excavated; front narrow and coarctate; palpi moderately swollen.....*epistates* O. S.
Antennae black with 3rd joint narrow and not noticeably excavated; front moderately broad; anterior branch of vein 3 frequently with basal stump11
11. Wings with bifurcation of 3rd vein clouded with brown....*sonomensis* O. S.
Wings with no cloud on bifurcation of third vein.....*phaenops* O. S.
12. Subcallus denuded, small species, 13mm.....*rupestris* McD.
Subcallus not denuded, larger species, 16mm.....*atrobasis* McD.

Tabanus affinis Kirby. This is the largest species in the group and apart from size is best recognized by its long thin palpi of a deep orange color and the strong dorsal excavation at the base of the third antennal joint. It extends completely across the Dominion of Canada and in the East at least is not liable to be confused with any other species. In British Columbia it is rather rare and the following species, as well as *haemaphorus* Mart., have masqueraded under this name. According to Miss Ricardo *triligatus* Walk. is a sure synonym.

Tabanus californicus Marten. This name has been sunk as a synonym of *epistates* O. S. by Hine (1904, Ohio Nat. V, 236). Marten's types are unfortunately not in existence but on account of the size mentioned in the original description (17mm.) and the fact that it is very doubtful if the true *epistates* occurs as far south as California, I am inclined to associate this name with a large Pacific Coast form closely allied structurally with *affinis* but differing very decidedly in the lateral coloration of the abdomen. In *affinis* the color is a rather rich orange-red whilst in the present species it is yellow-brown, shaded with lighter yellow along the segmental margins. I have seen two specimens from Oregon and the Canadian National Collection contains a series of six females taken by Dr. S. Hadwen at Mt. Lehman in the Lower Fraser Valley, B. C. Marten's original description particularly mentions this yellow-brown color and the remainder of his description fits in so satisfactorily with the present species that I have adopted the name without much hesitation.

Tabanus haemaphorus Marten. Hine has sunk this name as a synonym of *sonomensis* O. S. but I cannot accept this. The true *sonomensis* is a comparatively small species, whereas the size of *haemaphorus* is given by Marten as 16-18mm. What I consider to be this species has been generally passing under the name of *affinis* Kby. It is apparently the commonest British Columbia species, occurring in May and June and differs from the true *affinis* in the shorter and paler colored palpi and the less excised 3rd antennal joint; it is also somewhat more slender in build. Besides the British Columbia series in the National Collection I have seen specimens from Oregon.

Tabanus captonis Marten. I agree with Hine's identification of this species.

with *comastes* Will. as a synonym. As stated (1904, Ohio Nat. V, 235) the species is readily separated by its wide front and denuded subcallus:

The species is quite common on Vancouver Island and on the mainland of British Columbia in the Lower Fraser Valley.

***Tabanus lasiophthalmus* Macquart.** This is the only species of the group in which all the cross-veins of the wings are decidedly tinged with brown, which renders identification quite easy; other features are the denuded subcallus and the presence of pale yellowish oblique stripes laterally on the reddish areas of abdomen. It is just possible that occasional specimens occur in which the usual maculation of the wings is absent; one or two specimens before me which lack such maculation seem in all other respects to agree with normal specimens of *lasiophthalmus*. The species extends across the entire continent.

***Tabanus trepidus*, sp. nov.** ♀, Palpi long, thin, not swollen at base and tapering to a fine point, deep yellow-orange, rather heavily clothed with black hairs; antennae reddish, the dorsal and terminal portion of 3rd. segment blackish; 3rd segment rather chunky and only moderately excised dorsally at base; subcallus not denuded; front dull yellowish, moderately broad with callosity and a spindle shaped patch above it shiny black; thorax dull blackish with the usual pale obsolescent stripes and the antealer tubercles slightly tinged with reddish; abdomen much as in *lasiophthalmus* with lateral areas of first four segments broadly reddish-orange, with distinct traces of pale oblique yellow stripes, and with a black dorsal band, widest on 1st segment; ventrally yellow-orange, more or less shaded with smoky, terminal segments blackish; legs blackish, the proximal half of all tibiae tinged with orange-yellow; wings dull hyaline, costal cell and area surrounding longitudinal veins in basal half of wing tinged with brown.

Length 14-15mm.

***Holotype*.** 1♀, Ottawa, Ont. (June 26th., W. Metcalfe) in Canadian National Collection.

***Paratypes*.** Numerous ♀'s from Shelburne, N. S. (July 1st., A. Gibson); Harcourt, N. B.; Ottawa, Ont.; Ft. Coulonge, Que.; Aweme, Man. and Peachland, B. C., in Canadian National Collection.

The species has been frequently confused with *epistates* O. S., but can at once be differentiated by the long thin palpi; from *affinis* it differs in its smaller size and less excavated third joint of the antennae.

***Tabanus minusculus* Hine.** A single specimen of this small species is in the Canadian National Collection, kindly identified for me by Prof. J. Hine; it was captured at Ottawa, (Mer bleue, 26th., June, 1904) by Mr. W. Metcalfe. The palpi are extremely thin and the antennae show scarcely any excision of the basal portion of the 3rd joint. The subcallus is covered with a fine ochreous pollen and the callosity is brownish, extending up the front as a thin black line to the ocelligerous tubercle which is also brown.

***Tabanus epistates* O. S.** Several species have been confused under this name which would account for Hine's statement in his paper on Western Tabanidae (1904, Ohio Nat. V, 236). Osten Sacken's characterization is so clear, however, as to leave no doubt in any mind as to the species to which the name should be applied. The narrow coarctate front is quite characteristic; the palpi are moderately long, pale ochreous and distinctly swollen at the base, the subcallus

is not denuded and the antennae are generally almost entirely red with base of 3rd joint rather chunky and moderately excised. The pale oblique stripes on the abdomen, noted in *lasiophthalmus* and allied species, are not present in *epistates*. The species appears to be common throughout Manitoba Saskatchewan, and the Hudson Bay region, rather rare in Ontario, Quebec and New Brunswick and decidedly rare in British Columbia; the only two specimens from this latter region which I should incline to place under this name were captured at Vernon and Cranbrook; both are rather larger than normal and have the antennae more suffused with black than is generally the case.

***Tabanus nudus*, sp. nov.** This species has been so generally confused with *epistates* that a comparative description, indicating the points of distinction, is all that is necessary. The front is distinctly broader and the subcallus is denuded; the palpi are shorter and basally more swollen; the antennae are blacker apically, the basal portion of the 3rd joint is rather wider and the finger-like dorsal projection of the 2nd joint is much longer. The pale yellow lateral oblique stripes on the abdomen are present and only slightly less distinct than in *lasiophthalmus*. Length 15mm.

Holotype. 1♀, Ottawa (Mer bleue, June 1st., 1908), in Canadian National Collection.

Paratypes. Numerous ♀'s from New Brunswick (Fredericton, St. Stephen); Ontario, (Ottawa, Hastings Co.); Manitoba, (Aweme); Saskatchewan and British Columbia. (Mt. Lehman).

The species is much commoner and more wide-spread than *epistates*. ***Tabanus sonomensis* O. S.** The true *sonomensis* is a rather small species, confined, as far as I know, entirely to the Pacific Coast region. The British Columbia records I possess for the species are all from Vancouver Island but it probably will be found in the Lower Fraser Valley as well. Apart from its smaller size it may be distinguished from the preceding species by the entirely black antennae with a narrow thirdjoint, scarcely excised at base. There is a decided tendency towards a stump at the base of the anterior branch of the 3rd vein, the cross-vein being generally decidedly tinged with brown. Hine (1904, Ohio Nat. V, 244) has treated several forms under the name *sonomensis* but his remarks in the first paragraph are applicable to the true species.

***Tabanus phaenops* O. S.** The species is very closely allied to the preceding and I have not yet decided to my entire satisfaction whether the two can go definitely separated. Typical *phaenops* possesses almost blackish palpi in contradistinction to the pale ochreous ones of *sonomensis* but this character seems variable; Oregon specimens and ones from Laggan, Alta., which agree in other respects, have pale palpi. The lack of the brown spot on the cross-vein seems more characteristic and for the present I am using this feature to separate the two forms. The antennae are similar to those of *sonomensis* and the reddish area of the abdomen seems variable in its extent. The species is decidedly rare in Canada and more material will be necessary to definitely decide its status.

***Tabanus rupestris*, sp. nov.** ♀. Palpi moderately long, very little swollen at base, dull orange, at times considerably tinged with smoky; antennae thin, reddish, the distal half of 3rd joint black, very slight excavation dorsally at base of 3rd joint; subcallus denuded, shiny black; callosity shiny black with wedge-shaped black patch above it; front with yellowish pollen and black ocelligerous tubercle;

thorax blackish with the usual faint, pale lines; antealar tubercle black; abdomen dorsally with 1st segment almost entirely black, slight traces of orange being visible on the extreme lateral posterior area; a broad (2mm.) black dorsal band crosses segments II-IV, the lateral areas being deep orange-red, remaining segments black; slight traces of a paler flesh-colored oblique stripe on the red area of segment II; ventrally orange-red the posterior border of the 1st segment and the last three segments blackish; legs with all femora black, anterior tibiae tinged with orange proximally, other tibiae entirely dull orange; wings hyaline with costal cell brownish and a faint brown cloud at the base of the anterior branch of 3rd vein. Length 14mm.

Holotype. 1♀, Gallatin Co., Montana (July 14th., 7500 ft) in Canadian National Collection.

Paratypes, 2♀'s, Gallatin Co., Montana (July 27th., 5500 ft.) in Collection of Montana Agr. Coll.; Cowley, Alta. (Sept., R. N. Chrystal) in Canadian National Collection.

The species closely resembles *phaenops* but differs in the denuded subcallus, the redder antennae, the broader black area on 1st abdominal segment and the cloud on the outer cross-vein; none of the specimens before me shows any trace of a stump at the base of the anterior branch of vein 3 as is so often seen in *phaenops*; the extent of the black area on the first segment may be variable and should not be too much relied on as a sole means of separation from *phaenops*.

***Tabanus atrobasis*, sp. nov.** ♀. Palpi orange, heavily clothed with short black hair, not swollen at base; antennae black with 2nd joint and basal portion of 3rd red; dorsal angle at base of 3rd joint obtuse, with little excavation, this whole portion being rather slender; subcallus and front covered with pale yellowish pollen, latter moderately (.5-.75mm.) broad with shiny black-brown callosity extended towards as usual by a fine black line; thorax blackish with the five pale lines as usual and a black antealar tubercle; abdomen with first segment dorsally entirely black except a very narrow line of orange along posterior margin; second to fourth segments laterally orange, shaped somewhat with brownish; a broad (2mm.), black, dorsal band with more or less distinct central row of triangular pale spots situated on rear margin of segments and clothed with pale yellowish hair; last three segments blackish; rear margins of all segments with yellow hair; ventrally dull orange, shaded with smoky and with rear segments entirely black. Legs black, anterior tibiae slightly, other tibiae almost entirely dull-orange.

Length 16-17 mm.

Holotype. 1♀, Mt. Lehman, B. C. (May 30th., S. Hadwen) in Canadian National Collection.

Paratypes. Numerous ♀'s from various B. C. localities (Mt. Lehman, Victoria, Duncan, Courtenay, Royal Oak) in Canadian National Collection.

The species has apparently been confused with both *sonomensis* and *captonis*; the entirely black first abdominal segment seems quite characteristic and separates *atrobasis* from both the above mentioned forms; it is considerably larger than *sonomensis* and lacks the denuded subcallus and chunky third antennal joint of *captonis*. The species extends south into Oregon, a number of specimens having been received from Prof. Lovett, labelled either *sonomensis* or *epistates*.

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POPULAR AND PRACTICAL ENTOMOLOGY.

COLLECTING ABOUT WALDEN POND.

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Concord, Mass., will always be holy ground to philosophers and naturalists. Here lived and worked and here lie buried the members of that great school of thinkers and writers who will always maintain their distinctive place in American letters—Emerson, Thoreau, Alcott, Miss Alcott, Hawthorn, Sanborn and others.

In all the town, however, the one spot that attracts naturalists most is that called "Thoreau's cairn," situated on the edge of Walden Pond, where, as his biographer Sanborn remarks, "Thoreau spent one of his lives." The exact location of Thoreau's cairn is now marked by a pile of ordinary field stones which grows larger from year to year, as it is the custom for each visitor to add one stone to this monument. No memorial that man could build would be more appropriate in marking the spot where Thoreau made his innumerable observations of nature and where "Walden" must have been conceived. It is especially satisfying to each visitor to know that he has personally added his mite to the monument called "Thoreau's cairn."

Should Thoreau return to Walden today he would find it much different from the beautiful, quiet New England lake that he knew. On one side of it now runs a railroad that he saw in course of construction and trains roar by, from time to time; on the other side automobiles race by on a perfect State road. The shouts of bathers disturb the quiet until far into the Summer night. The forests have nearly all been cut over; at times fires rage through the woods about the pond, and the chestnuts that have escaped the scourge of fire are rapidly dying from the attack of the chestnut bark disease. Young pines are destroyed or deformed by the work of the white pine weevil and gipsy moth larvae defoliate the trees generally. A few stately pines still remain, however, perhaps the only living things that were once Thoreau's associates at Walden.

For two years past, Walden Pond has been one of the chief collecting grounds of the writer. Happy the day, when it has been possible to spend a few hours in the open there. At all seasons interesting material is to be found; in Winter and Spring under the bark of dead trees, in logs and stumps, and under stones; during Summer and Fall by beating foliage with a net.

In the early Spring, Elaterids are numerous in rotting stumps and logs. Such interesting species as *Alaus myops* (Fab.), *Adelocera discoidea* (Web.), and *brevicornis* Lec., *Elatér linteus* Say, and *nigricollis* Hbst., and *Corymbites hieroglyphicus* (Say) being among the most showy, together with many others. Cucujids are to be found beneath the dead bark of trees in some numbers, including the showy *Cucujus clavipes* Fab. and the sombre colored *Brontes dubius* Fab. Fungus beetles of considerable variety, together with other species of

beetles whose habitat is dead logs and stumps, are numerous. The beautiful *Aphorista vittata* (Fab.) is occasionally found, *Eustrophinus bicolor* Fab., *Orchesia castanea* Melsh. and *Holostrophus bifasciatus* (Say) are numerous, while *Scaphidium piceum* Melsh. and *Scaphisoma convexum* Say are less so.

Somewhat later *Microtonus sericans* Lec. *Canifa pusilla* (Hald.), *Capnochroa fuliginosa* (Melsh.), *Aphorista vittata* (Fab.), *Mycetophagus flexuosus* Say, *Litargus didesmus* Say and *Lathridius liratus* Lec. are among the interesting species that can be found either under bark or by sweeping. Throughout the Summer Chrysomelids are numerous, including species of such striking groups as *Pachybrachys* and *Cryptocephalus* and species of *Donacia*. *Calosoma sycophanta* L. can be found climbing in search of Gipsy moth larvae.

Representatives of the Hemipterous groups are common during the Summer and a considerable number of species occur. Among the *Pentatomidae*, there may be mentioned such interesting species as *Podisus placidus* Uhl., *Perillus exaphus* Say, *Banasa dimidiata* (Say), and *Peribalus limbolarius* Stal., while *Euschistus* is represented by several species, *variolarius* (P.B.), *tristigmus* Say, and *ictericus* (Linn.).

Species of the very interesting Fulgorid genus *Oliocarus* are found occasionally, while late in the season *Acanalonia bivittata* Say is quite numerous. Throughout the Summer the Cercopids are plentiful, the innumerable forms of *Philaenus leucophthalmus* (Linn.) and *Clastoptera proteus* Fitch and *obtusa* (Say) being most numerous.

Leafhoppers are numerous in species and individuals, some of the most showy being *Eutettix southwicki* (Van D.), *johnsoni* Van D., *seminudus* (Say), and *strobi* Fitch; *Jassus olitorius* Say, *Chlorotettix unicolor* (Fitch) and *tergatus* (Fitch), *Penthimia americana* Fitch, *Mesamia vitelina* (Fitch), and *Acocephalus nervosus* (Schrank).

Everything considered, Walden Pond has proved to be one of the most favorable collecting grounds that the writer has found near Boston, and a visit to these sacred haunts has yet to be made without turning up something interesting or not previously taken.

These specimens labeled "Concord" seem a little more valuable than others, perhaps for the reason that Thoreau may have observed and wondered at the means of life of the forbears of these specimens which now repose in my cabinet; even as we today wonder and search to learn how and why they live, so that in far future years our posterity may more clearly understand and appreciate that greatest riddle of all—life.

NOTES ON THE INSECTS OF THE SPREADING DOGBANE,
APOCYNUM ANDROSAEMIFOLIUM L., WITH A
DESCRIPTION OF A NEW DOGBANE
MIDGE, BY DR. E. P. FELT.

BY HARRY B. WEISS AND ERDMAN WEST,
New Brunswick, N. J.

The following notes are the results of miscellaneous observation, made for the most part on *Chrysochus auratus* during the summer of 1920. In addition it was thought desirable to add brief accounts of other dogbane insects

and to indicate the important references dealing with such species and their life histories. We are very grateful to the specialists whose names are mentioned in the text, for identifications and other help. In the description of the larva of *Chrysochus auratus*, we have followed the form suggested by Mr. F. C. Craighead and Dr. Adam Boving, who have done noteworthy work in this field and to whom our sincere thanks are due for generous help and advice with this and other larval descriptions.

The spreading dogbane *Apocynum androsaemifolium* L., is a perennial herb, fairly common and well distributed. In New Jersey it flowers from mid June to late July or into August and may be found in large and small patches along roadsides, in fields and neglected orchards, etc. The following are the accounts of insects more or less closely associated with this plant.

***Chrysochus auratus* Fab. (Coleop.)**

This species known as the gold gilt or goldsmith beetle is well known as a feeder on dogbane. It has also been recorded as feeding on milkweed (Blatchley, Col. Ind., p. 1141; Smith, Ins. N.J., p. 344) and other plants. Newell and Smith (Bul. 52, U.S. Bur. Ent., p. 70) state that in northern Georgia the beetle did much damage in a small pecan grove by defoliating the trees. Felt (16th Rept. Bul. N. Y. St. Mus., vol. VII., No. 36) says that it lives by preference on dogbane and though there are accounts of the beetle attacking other plants, they are probably erroneous or the insects may have been driven by hunger to feed on plants otherwise unmolested. In New Jersey we have found it confined almost exclusively to dogbane and occasionally on milkweed.

The beetles can be found from the last of May until almost to the middle of August, feeding usually on the edges of the leaves and consuming all of the tissue, thus entirely destroying the natural outlines. Egg laying takes place over a long period, it being possible to find unhatched eggs as late as the first of August. Most of them, however, hatch during July. The eggs are deposited in groups of two and three, being laid on their sides, usually on the under surface of a leaf near the edge and covered with a little cone of excrement. Sometimes they are found on the stems of the plants or on fence posts, etc., close to infested plants. Zabriskie (Jour. N. Y. Ent. Soc., vol iii., p. 192) states that the egg capsules measure about 3 mm. long by 2 mm. high and are composed of brown and black pellets moulded in a conical or irregular ovoid form. Under the microscope, the macerated and crushed material shows no particular structure, but spores of saprophytic fungi and minute grains of sand are frequently present. Zabriskie also states that he discovered a beetle ovipositing in the opening at the summit of a cone and that in the crater of the cone was an egg, evidently just deposited. Considering the fact that the eggs are elongate and laid on their sides on the leaf, it does not seem possible that they could be easily placed in such a position after the cone was formed. In the field cones with open craters were always found to be empty or to contain empty egg shells. From this, it seems reasonable to assume that the cone is built over the eggs after they have been laid and that Zabriskie probably observed a cone before it had been entirely completed.

After hatching, the larva eats through the capsule at or near the small end and drops to the ground which it enters. Later, it can be found on the roots.

By the middle and last of October, all sizes of larvae except small ones can be found on the roots. Some are apparently full grown at this time. They are best located by taking the top soil off and exposing the upper surfaces of the root stocks. After the stocks have been followed out and laid bare for several feet from the base of the plant, they should be cut in sections and carefully lifted up. When larvae are present, they will be found in the soil directly under the injured portions of the roots. Most of the larvae are found feeding on the lower surface of the root stock from four to twelve inches away from the base of the plant. Irregular, longitudinal channels are eaten in the lower side of the root, everything except the central woody portion being consumed. Sometimes the channels extend part way on the upper root surface. From the fact that diggings made as late as November revealed full and partly grown larvae, it appears that pupation takes place in the spring or early summer.

Egg. Length 1.5 mm. Greatest width, 0.58 mm. Whitish, elongate, sub-elliptical, sides slightly arcuate; obtusely rounded at both ends, one end slightly broader than the other; chorion apparently smooth.

Full Grown Larva. Length about 12 mm. Width about 3.5 mm. Form cylindrical, slightly curved, lightly chitinized, creamy white. Head subcircular, flat, depressed; collum absent; occipital foramen subtriangular; epicranial halves separated dorsally by a faint median suture; front flat; gula indistinct, membranous; ventral mouth parts fleshy and slightly retracted; maxillary sclerite absent; clypeus narrow, transverse; labrum oval, anterior edge arcuate and bearing several minute hairs; antennae laterally inserted, two jointed, supplementary joint not as wide but almost as long as apical joint; ocelli absent; mandibles biting type without molar structure, bifid at apex; maxilla fused with labium to near its apex; maxillary palpi four jointed including palpifer; lacinia inserted below palpifer, short, finger-shaped, rounded at apex, bearing several chitinous hairs on apex and inner surface; galea absent; cardo triangular, of one piece, chitinized; labium with mentum and submentum fused and indistinct; labial stipes ring-like, labial palpi one jointed. Protergum twice as wide as long bearing lightly chitinized plate. Meso and metatergum each bearing three hair bearing processes. Pre and postepipleuron well developed, both bearing setose lobes. Hypopleural chitinizations of thorax faintly indicated. Coxae widely separated. Legs weak, slender, bearing several hairs, five-jointed, tarsus long, slender, claw-like. Epipleura and hypopleura slightly produced bearing setose lobes. Abdominal segments transversely ridged dorsally, each ridge bearing a row of hairs; coxal lobe with pronounced ambulatory tubercles with long setae; ninth abdominal segment without cerci; tenth segment terminal, wart-like, composed of three anal lobes, two lateral, chitinized and one dorsal; anal opening longitudinal; median ventral portion of each abdominal segment bearing numerous minute hairs. Spiracles annuliform, thoracic on anterior margin of mesothorax.

The adult was described by Fabricius in 1775 (Ent. Syst. 101) and later mentioned in various lists and publications.

***Lasioptera apocyni* Felt (Dip.)**

At New Brunswick, N.J., on August 1, numerous oval, depressed stem discolorations were observed in a patch of dogbane. Closer observation showed

empty, dipterous pupal cases projecting from these areas and narrow oval cells beneath the infested parts of the stems. Most of the discolorations were on the lower half of the stem and many were only five or six inches above the ground. Practically all of the adults had emerged when the infestation was noted, but on August 6 an adult was secured and sent to Dr. Felt, who found that it represented a new species. He very kindly drew up the following account and description which is published with his permission.

"*Lasioptera apocyni* n. sp.

This one midge reared was received under date of August 9, 1920, from H. B. Weiss, Trenton, N.J., accompanied by the statement that the insect had been reared from dogbane, *Apocynum androsaemifolium*. The specimen was labeled 'New Brunswick, N.J., from stems of dogbane, August 6, 1920.' This species approaches *L. inustorum* Felt from which it may be easily distinguished by its smaller size and different coloration.

Gall. The gall is an irregularly oval, dull reddish orange stem discoloration with a length of 1 cm. and a diameter of .3 cm. Narrowly oval cells may be found just beneath the surface of the affected parts of the stem.

Female. Length 1mm. Antennae hardly reaching to the base of the abdomen, sparsely haired, dark brown, 21 segments, the 5th with a length about three-fourths its diameter, terminal segment somewhat produced with a length one-fourth greater than its diameter, the tip broadly rounded. Palpi, first segment short, subquadrate, the second with a length nearly twice its diameter, the third one-fourth longer than the second, more slender, and the fourth a little longer and more slender than the third. Mesonotum dark reddish brown, scutellum and post scutellum reddish brown. Abdomen dark brown, the segments narrowly margined posteriorly with white scales. Ovipositor with a length about half that of the abdomen, the basal portion moderately long, the lobes narrowly oval, with a length three times the width, sparsely haired; wings hyaline, the discal spot small and at the basal half. Halteres whitish transparent, yellowish orange basally. Coxae and base of femora dull yellowish orange, the distal portion of femora, tibiae and tarsi apparently a nearly uniform dark brown. Claws rather long, slender, unidentate. Type A 3141 N. Y. State Museum."

On August 10, a parasite was bred from the infested stems, which was identified by Mr. S. A. Rohwer, through the courtesy of Dr. L. O. Howard, as a species of *Tetrastichus*.

***Ammalo tenera* Hubner (Lep.)**

This is one of the tiger moths and a common species in the Atlantic States, the larva feeding on the foliage of dogbane. In the northern and middle sections of New Jersey, the moths are most plentiful in the vicinity of dogbane about the middle of June, at which time eggs are deposited. The larvae feed during the night or at dusk and hide by day at the bases of the plants. Under the name *Euchaetes collaris* Fitch, various references are given to this species by Edwards (Bul. 35, U. S. Nat. Mus.). Among these, Jewett (Can. Ent., vol. xii., p. 228, 1880) states that at Dayton, Ohio, the larva fed on *Asclepias incarnata* and refused *A. cornuti*, while Van Wagener (Can. Ent., vol ix., pp. 170-171, 1877) gives dogbane as the food plant, stating that the larvae will in confinement feed on *Asclepias*, but that he never found but one larva on *Asclepias* in the

field and this after careful search. He also states that they are solitary feeders and that they leave their food plant during the day and hide. Jewett (loc. cit.) states that there are from three to four broods a year, each one requiring from 37 to 39 days, the fall brood hibernating as pupae.

Jewett (loc. cit.) describes the egg and Van Wagenen (loc. cit.) gives a description of the larva, which was drawn up for him by Lintner. Edwards (Papilio, vol. iii., pp. 145-8, 1883) under the name *E. collaris* gives brief descriptions of the larvae after each moult, beginning with the second. The adult was described by Hubner in 1818 (Zutr. exot. Schmett., i. 7, f. 3, 4,). Barnes and McDunnough in their Check List of Lep. of Bor. Amer., 1917, give *collaris* Fitch and *antica* Wlk. as synonyms.

Haemorrhagia diffinis Boisd. (Lep.)

Under the generic name *Hemaris*, Edwards (Bul. 35, U. S. Nat. Mus.) lists dogbane as a food plant of this species and gives several references to the larva. Mead (Can. Ent., vol. ii., p. 157) gives a brief description of the larva and lists snowberry as the food plant. Lintner (24th Rept. N. Y. St. Mus. Nat. His., pp. 109-11, 1870) gives a description of the larva and cocoon and states that the larva was taken on bush honeysuckle *Dicervilla trifida*. We have not noted this insect on dogbane in New Jersey, although Smith (Ins. N. J., p. 425) records it as not rare, larva on *Apocynum* and *Symphoricarpus*.

Pyrausta futilalis Led. (Lep.)

On several different occasions, the yellowish, black spotted larvae of this species were abundant on dogbane, notably at New Brunswick, N.J., July 25, Oct. 2, and Princeton Junction, N.J., July 28. They were found in colonies webbing up the foliage and tips, feeding thereon and destroying everything except the larger veins of some leaves. They hide by day in the curled up partly eaten leaves and feed at dusk and during the night. At the approach of cool weather, larvae under observation constructed rather loosely built cocoons within curled and pulled-together partly eaten leaves. Dormant larvae were found in such situations in November, and from this it appears that pupation may occur in the spring. Most of the larvae under observation were parasitized. The adult was described in 1863 by Lederer (Wien. ent. Mon., vii., 467). Dyar in his Check List (Bul. 52, U. S. Nat. Mus.) gives *erectalis* Grote as a synonym and the distribution as the Atlantic States.

A good account of this species by Dr. E. P. Felt is found in Lintner's 11th Report on the Injurious and Other Insects of the State of New York (49th Rept. N. Y. St. Mus., 1896, pp 138-142). This paper includes notes on the habits of the larvae, descriptions of the larval stages, number of generations, etc., together with a bibliography of the literature up to 1896.

MISCELLANEOUS SPECIES FOUND ASSOCIATED WITH DOGBANE.

Very little opportunity was afforded to collect the insect visitors and the following list is recognized as woefully incomplete.

HOMOPTERA.

Aphis asclepiadis Fitch. New Brunswick, N.J., June 14, on leaves and stems. (det. C. P. Gillette).

HEMIPTERA.

Lopidea confluenta Say. Monmouth Jc., N.J., July 14, on leaves. (det. H. G. Barber).

Poecilocystus basalis Reut. New Brunswick, N.J., July 4, on leaves.

COLEOPTERA.

Typophorus canellus Fab. var. *aterrimus* Oliv. Monmouth Jc., N.J., July 14, on leaves. (det. C. A. Frost).

Monachus ater Hald. Monmouth Jc., N.J., July 14, on leaves. (det. C. A. Frost).

Chauliognathus marginatus Fab. New Brunswick, N.J., June 26, at flowers.

Nodonota puncticollis Say. New Brunswick, N.J., June 26, feeding on leaves. (det. C. A. Frost).

LEPIDOPTERA.

Ammalo tenera Hbn. Monmouth Jc., N.J., June 15, resting on leaves. (det. F. E. Watson).

Ectypia clio Pack. Under the name *Scirarctia clio*, Dr. H. Behr (Papilio, vol. 2, p. 187) records the occurrence of this species on *Apocynum androsaemifolium* in the larval stage and the rearing of several moths from larvae collected before May 20. On May 20 a cocoon was started and on July 12 adults were secured.

Archips rosaceana Harr. Elizabeth, N.J., August 4, larvae feeding at tips of leaves.

Tortrix clemensiana Fernald. Bound Brook, N.J., pupa taken from rolled up leaf. (det. A. Busck).

Eulia velutinana Walker. Bound Brook, N.J., Sept. 7. Bred from larva found in August webbing up several leaves and feeding therein. (det. A. Busck).

Poanes massasoit Scud. Monmouth Jc., N.J., July 14, visiting flowers. (det. F. E. Watson).

DIPTERA.

Chrysomyia macellaria Fab. New Brunswick, N.J., July 4, visiting flowers. (det. J. R. Malloch).

Lucilia sylvarum Mg. New Brunswick, N.J., July 4, visiting flowers. (det. J. R. Malloch).

Mr. Raymond C. Osburn writing in the Ohio Journal of Science (vol. xx., No. 7, May, 1920, under the title "The Syrphid Fly, *Mesogramma marginata* and the Flowers of *Apocynum*," gives an interesting account of his observations on the relation between the flowers of dogbane and their insect visitors, special attention being paid to *M. marginata* Say, of which numerous specimens were noted as having been captured, each being held fast by the proboscis. Mr. Osburn states that some of the flies were not held between the edges of the anthers, but were stuck fast on the outer surface of the anther, and in one case on the inner surface of the corolla. He also calls attention to a hitherto neglected factor in the process of entrapment, namely the adhesive nectar. *Mesogrammas* coming to a flower cluster were noted as entering and emerging without difficulty several times, but upon watching individual flies it was found that they were eventually caught. Mr. Osburn explains this by saying that the flies are not held until the proboscis becomes sufficiently gummed-up with the

sticky secretion. In the same paper will be found a list of flower visitors not caught and summaries of other papers dealing with *Apocynum* insect visitors.

A REVISION OF SYRPHUS SPECIES BELONGING TO THE
RIBESII GROUP (DIPT.)

BY C. HOWARD CURRAN,
Orillia, Ontario.

With the recognition of three European species of *Syrphus* in Canada, viz. *S. vitripennis* Meig., *nitidicollis* Meig., and *ochrostomus* Zett., and the discovery of some species which are evidently undescribed, the need of a revised synopsis of those species with the disc of the thoracal squamæ hairy seems desirable. Several of the species are very closely related and often separable only after considerable study. Without going into minute detail, the author hopes, by means of the present paper, to render the identification of the various species less difficult than it is at present owing to the scattered nature of the descriptions.

The chief characteristics of the members of this group lie in the presence of three principal yellow or reddish yellow abdominal bands, the first of which is interrupted, the two following entire, and reaching the lateral margins of the segments, except in *S. opinator* O.S. Nine species have the squamæ pilose above and eight bare, although if *S. insolitus* Osb., which belongs to this group, is included, nine species belong to each section.

Syrphus xanthostomus Will., recognized from *S. grossulariæ* by its yellow antennæ and yellow scutellar pile and *S. insolitus*, which has a black face, are not dealt with in this paper.

TABLE OF SPECIES.

1.	Disc of thoracal squamæ hairy	2
	Disc of thoracal squamæ pilose	14
2.	Eyes pilose ♂ ♀ <i>torvus</i> O.S.	
	Eyes bare	3
3.	Hind femora of female black at base ♀ <i>vitripennis</i> Mg.	
	Hind femora of female yellow at base	4
4.	Second and third bands do not reach abdominal margins. ♂ ♀ <i>opinator</i> O.S.	
	Second and third bands reach margins	5
5.	Abdominal bands extend over margins in their full width; legs bright yellow except dark band on hind femora; middle basitarsi with all yellow small spines below. 11-12mm. ♂ ♀ <i>knabi</i> Shannon	
	Bands usually attenuated laterally; middle basitarsi with black spines below	6
6.	Hind femora black at base	11
	Hind femora yellow at base	7
7.	Femora wholly yellow in both sexes; antennæ reddish; cheeks often narrowly blackish below the eyes ♂ ♀ <i>protritus</i> O.S.	
	Femora not wholly yellow; antennæ chiefly blackish	8
8.	Abdomen with the sides strongly reflexed downwards; apical segments all visible from above ♀ <i>transversalis</i> n. sp.	

- Abdomen not so shaped 9
9. Face with a median brownish or blackish stripe; femora of hind legs with brownish band; venter with alternate black and yellow bands ♀ *ribesii vittafrons* Shan.
Face with median dark stripe 10
10. Venter unicolorous; abdominal bands not much attenuated laterally and seldom notched posteriorly; the spots on the second segment reach the margin in almost the full width of one spot; smaller, seldom over 9 mm. ♀ *rectus* O.S.
Venter usually with alternate yellow and black bands, but these sometimes very faint or represented by isolated spots; spots on second segment reach the margin in not more than half the width of the spot; abdominal bands always distinctly notched posteriorly and attenuated laterally ♀ *ribesii* L.
11. Antennæ red; hind femora with about the apical third yellow; tiny black bristles on end of femora sparse, sometimes they are almost all pale; hind tibiæ with a moderately narrow, more or less obscure postmedian band darker ♂ *vitripennis* Mg.
Flies without all these characters 12
12. Face with a median blackish or brownish stripe . . . ♂ *ribesii vittafrons* Shan.
Face wholly yellow 13
13. Venter unicolorous; first band or spots reach the lateral margin of the segment in at least half the width of the spots; pile of vertex more tawny; fewer small black bristles on hind femora (about 9) ♂ *rectus* O.S.
Venter as in couplet 10-2; first abdominal band reaches the sides very narrowly; pile of vertex pale yellow (about 11 or 12 mm.) . . ♂ *ribesii* L.
14. Antennæ black; abdominal bands extended over side margins in their full width; eyes bare ♂ ♀ *grossulariae* Mg.
Antennæ more or less reddish 15
15. Eyes pilose; face with median black stripe ♀ *reflectipennis* n. sp.
Eyes bare; face sometimes with median black stripe 16
16. Face with median dark stripe 17
Face without median dark stripe; antennæ reddish 18
17. Female bands reach the margins in their full width; base and tip of hind femora yellow (Eastern species) ♀ *genualis* Will.
Female bands attenuated laterally and moderately biconvex posteriorly; hind femora yellow, with brownish band on apical half; male very similar to *S. rectus* (Western species) *rectoides* n. sp.
18. Scutellum yellow haired *ochrostomus* Zett.
Scutellum black haired *nitidicollis* Mg.

Note: *S. xanthostomus* Will. differs from *S. ochrostomus* in having the abdominal bands very wide and not at all metallic.

Verrall (Brit. Fl., vol. viii.) states that the venter of *S. ribesii* is usually unicolorous. I have an English specimen in which it is as described above; other Canadian specimens show very light markings, but I think there are always sufficient darker markings present to readily

distinguish the species from *S. rectus*; *S. knabi* and *ribesii vittafrons* show the character very strongly, as do most of the North American specimens which I have examined.

***Syrphus protritrus* O. S.**

Legs in both sexes wholly reddish yellow, the tarsi somewhat darker. Antennæ reddish. From *S. rectus* it is distinguished by the wholly yellow femora, reddish antennæ and posteriorly notched abdominal bands. There are fewer black bristles on the apical half of the hind femora than in *S. ribesii*.

Five specimens from Manitoba (Dr. A. J. Hunter) and one specimen, Orillia, Ontario (Curran).

***Syrphus knabi* Shannon.**

A large and distinct species with bright yellow bands which extend over the margins in practically their full width, except in occasional males. Squamæ pilose above. Face wholly yellow. Legs reddish yellow, the hind femora in both sexes with a brown or blackish post median band. Middle basitarsi with wholly yellow bristles below, thus differing from all other species with pilose squamæ. Scutellum chiefly black haired. Sides of thorax distinctly yellowish. Length 11—12 mm.

A common species in Ontario, where the larvæ live upon aphids on elm (*Lanigera* sp. on *Ulmus*). I have found two and three larvæ in a single curled leaf. I have also specimens from Manitoba collected by Dr. A. J. Hunter at Winnipeg and Teulon. The species was originally described from Maryland and Virginia.

***Syrphus ribesii* L.**

Large, 11 to 12 mm. Antennæ usually largely brownish, but sometimes mostly reddish. Abdominal venter usually with alternate yellow and blackish bands, sometimes obscure or represented by isolated spots. Legs in female mostly yellow, sometimes with an indistinct post median brownish band on posterior femora; legs of male black on basal third of front four femora, the hind femora black except the tip of apical sixth; hind femora on apical half are thickly black bristly and their tibiæ bear prominent black pile on the outer side. The bare eyes distinguish it at once from *S. torvus*; the black spines below the middle basitarsi from *S. knabi*; the darker antennæ and more numerous spines on femora as well as the more extensively black hind femora from *S. vitripennis*; the darker legs, antennæ and larger size from *S. protritrus*; and the fasciate venter from *S. rectus*.

S. ribesii is not common in Ontario, although it is met with occasionally. In five years I have taken only eight specimens. It seems to be much more common in Manitoba, where Dr. Hunter captured some twelve specimens in September.

***Syrphus ribesii vittafrons* Shannon.**

Very similar to the typical *ribesii* but with a median brownish facial stripe and the pile of the vertex more fulvous. The ventral abdominal markings are very distinct so this variety can hardly be confused with other species. The hind femora of the female always bear a brownish post median band. (Common, Ont., Man.)

Syrphus rectus O. S.

This species which has long been confused with *S. ribesii* is undoubtedly distinct, but specimens occur which can only be distinguished with certainty from that species by an examination of the genitalia, unless the characters I have indicated, viz. practically unicolorous venter, will apply to all specimens from various localities as it does to all I have examined. Another very good character for separating the two species lies in the more broadly yellow sides of the second abdominal segment in *rectus*. The more sparse tiny black bristles on the end of the hind femora, the distinct bluish metallic reflection of the thorax, as well as the more sparse pubescence of the scutellum are also important characters, but difficult to use except by a specialist. In most specimens of *S. ribesii* the venter bears the bands described, while in most specimens of *rectus* there are seldom even isolated spots in the male, and never in the female. I cannot satisfy myself that the spots on the venter of *S. rectus* males are really ventral spots, as they appear on the sides of the ventral segments and apparently are the darker bands of the dorsum seen through the venter, while in *ribesii* there are always spots in the middle of the segments. The hind femora of the female always bear a blackish post median band as in *ribesii vittafrons*, but in the typical *ribesii* the bands are never more than brownish. The face is wholly yellow and there is no spot below the eyes.

This is the most common species of the genus in Ontario. I have counted thirty-seven specimens on a single bloom of Elder, and during early July of last year a large field of Elder bushes had the blooms literally covered with specimens. In fact this was the only species present. While *Syrphus ribesii* has been frequently recorded and figured from Ontario, it seems that the majority of records refer to this present species. Hunter took twenty-five specimens at the Manitoba Agricultural College, Winnipeg, on August 17th and 21st, but I have only seen one specimen from Teulon (near Lake Winnipeg).

Syrphus transversalis, new species.

Sides of the abdomen strongly reflexed downwards beyond the second segment; otherwise moderately like *S. rectus*.

Length, 8 to 9 mm. Female. Face yellow, with white pile. Front black, black pilose, clothed with yellowish pollen in front of the ocelli, except for a large triangular, shining black area in the middle. Pile of the posterior orbits yellow; eyes bare. Antennæ yellow, tips of the first two segments and the upper quarter and end of the third segment, brown or black.

Thorax shining greenish black, with yellowish pile. Scutellum yellow, with black pile.

Abdomen opaque black; a pair of broadly separated triangular yellow spots on the middle of the second segment, their inner ends rounded, the outer ends extending narrowly forward along the sides to the base of the segment. Third segment with an entire, basal, straight, moderately broad yellow band, which reaches the margins in practically its full width. Band on fourth segment similar, but slightly narrower. Broad apex of fourth segment, and tips of following segments, yellowish. Pile on basal quarter and on the yellow bands, yellowish, elsewhere short, sub-appressed, black.

Legs yellow; hind femora with a broad blackish ring beyond the middle; a

broad preapical ring on the hind tibiae and the hind tarsi piceous. Legs with whitish pile, but the hind tibiae and tarsi black pilose.

Holotype, Female, Orillia Ont., June 26, 1914 (Curran) and two paratypes, same locality, in the author's collection.

The shape of the abdomen in living specimens is remarkable; the abdomen is rather broad, and truncate at the apex, and all the terminal segments are visible from above, due to the apex of the fifth segment being strongly curved upwards. The species is found in deep woods.

***Syrphus vitripennis* Meigen.**

Habitat: Manitoba.

Length, 9mm. Male. Face yellow, with a bluish opalescence and whitish pile, except on the upper angles; tubercle, margin narrowly and the cheeks, more reddish; anterior tip of oral margin brown. Cheeks brownish below the eyes. Frontal triangle black, with a bluish reflection, its sides and apex moderately yellowish gray pollinose; entirely black pilose; above the antennæ the front is reddish yellow on the antennal prominence. Antennæ reddish; end of third joint evenly rounded. Posterior orbits wholly gray pollinose, with grayish pile below, yellowish above. Vertical triangle broader than in *ribesii* or *rectus*; wholly black pilose. Thorax greenish blue, very strongly metallic, with irregular dull cupreous areas; pleuræ blackish beneath the grayish pollen. A yellowish spot above the root of the wing. Postalar callosities piceous-black. Pile yellow; above the wings reddish; on the pleuræ more whitish. Scutellum yellow, scarcely shining, with sparse black pile except on the base and angles, where it is yellowish. Abdomen opaque black; tip of the second, apical half of third except the tip, and the following segments wholly shining. First segment obscurely reddish on the sides. Second segment with a pair of moderate sized, broadly separated yellow spots which are produced forward to the anterior margin; the black on the posterior half of the segment extends forward along the margin to beyond the middle of the segment. Second band moderately separated from the anterior margin of the segment, except at the sides where it reaches the antero-lateral angle. In front it is almost straight, with sometimes a small median yellow triangle extending forward; posteriorly it is biconvex and reaches the margin in over one-third its width. Third band similar. Tip of the fourth and the fifth segment except the base, reddish. Pile on basal one and one-half segments cinereous, on the yellow spots on the second segment, long, bright yellow; on the remaining yellow bands blackish medially, pallid laterally; elsewhere, rather long, black. Legs reddish-yellow; basal third of the fourth anterior and two-thirds of the posterior femora, an obscure band beyond the middle of the hind tibiae and the hind tarsi brownish in the middle. Wings hyaline, the base, costal cell and stigma yellowish. Squamæ yellowish, pilose above, fringed with yellowish hairs. All the abdominal bands are somewhat reddish.

Female. Antennæ sometimes brownish above; arista brownish apically; front shining blackish above the antennæ, the reddish color more restricted; above this a moderately large triangular bronzed area which connects above with the shining greenish and bronzed upper third of the frons; pile entirely black. First pair of abdominal spots more oval; sides of first segment yellow;

fifth segment with yellow triangles at anterior angles; pile slightly shorter throughout; cheeks without distinct black spots, and pallidly yellow. Otherwise similar to the male.

Six specimens, Teulon, Man., May to Sept. (Dr. A. J. Hunter).

From *ribesii* it differs in having the antennæ red; thorax darker, antennæ less pointed; spot below the eyes; femora of female, black at base; the first pair of spots reach the margins in much greater width than in *ribesii*. From *rectus* it differs in the color of the antennæ, legs, and narrower abdominal bands. From *protritus*, to which it is closely related, in having the legs in both sexes largely black.

***Syrphus opinator* O. S.**

Easily recognized. Squamæ pilose above; first abdominal band reaches the margin, the two following narrowly separated from margin; venter of female usually without black markings, venter of male with an elongate transverse black spot on second ventral and two broad complete black bands on following segments.

A western species which occurs west of the Rockies and as far east as Alberta in Canada. Five specimens from California (Davidson), B.C. (C. B. D. Garrett), and Alta. (Walsh).

***Syrphus torvus* O. S.**

Readily distinguished by the presence of pile on the disc of the squamæ and pilose eyes. The species may be recognized at a glance by the elongate brown stigma and the presence of blackish spots on the venter, which are quite different from those in other species. The first spot is roundish, the second triangular, and the third usually extends wholly across the posterior margin of the third ventral. The base of the hind femora of the female is black.

A widely distributed and common species. I have specimens from Cal., B.C., Man., Ont. and N.H.

The above species constitute an unusually interesting group in the genus *Syrphus* and so far as I am aware there are no other European or North American species which have the disc of the thoracal squamæ hairy. Three of the species, *S. torvus*, *vitripennis* and *ribesii*, are common to Europe and North America. The species which follow all lack the pile on the disc of the squamæ but several are closely related to those above described.

***Syrphus grossulariae* Meigen.**

A large beautiful species in which the abdominal bands extend over the side margins in their full width, including the basal spots. The wholly black antennæ and absence of pile on the disc of the squamæ and the black haired scutellum will readily distinguish this species.

I have a melanic female from Orillia in which the bands are shining metallic greenish with a reddish color distinguishable in some lights.

Syrphus xanthostomus Will. has the abdominal bands broader, the antennæ reddish and the scutellum yellow pilose.

***Syrphus reflectipennis* new species.**

Eyes pilose; face with rather broad median black stripe; thorax metallic blackish blue, the scutellum similar, with a yellowish translucent reflection;

abdominal bands reach the margins in their full width. Squamæ not pilose above.

Length, 11.5 mm. Female. Face yellowish; cheeks, oral margin and a broad facial stripe, ending below the antennæ, blackish. Front shining black, with a metallic blue reflection, the sides opposite the antennæ narrowly dusted with yellowish pollen, expanding in the middle of the front, but leaving a broad shining stripe. Pile of the front black, of the posterior orbits and cheeks, whitish; of the eyes, whitish, sparse, not very conspicuous. Antennæ reddish, third joint above, and the arista, piceous.

Thorax with a strong metallic bluish reflection, pleuræ obscurely piceous, especially the sutures; scutellum metallic blue, translucent; pile of dorsum yellowish, of the pleuræ, longer, whitish, of the scutellum, longer, yellowish.

Abdomen, sub-opaque, moderately shining, the first and apical segments shining bluish black. Abdominal bands as in *Syrphus torvus*, but slightly narrower, deeply notched medially posteriorly, and extending over the margins in their full width. Pile yellowish on the two basal segments and the yellow bands, elsewhere, shorter, black.

Legs yellow; basal half of the front four and two-thirds of the hind femora, black; a band beyond the middle of the hind tibiæ and the apical joints of the hind tarsi, piceous.

Wings pellucid hyaline; stigma faintly yellowish.

Holotype, female, Orillia, Ont., May 26, 1913 (Curran), in the author's collection.

***Syrphus ochrostomus* Zett.**

Antennæ red; differs from *ribesii*, *protritus*, etc., in the squamæ not being hairy above; from *grossulariae* in having red antennæ and legs, and narrower bands. Face yellow, with whitish pollen on the sides. Cheeks more reddish, with a large black spot below the eyes and the border of the eyes black from this spot to the posterior orbits. Thorax shining metallic greenish black, the pleuræ covered with whitish dust and almost white pile. Scutellum wholly yellow pilose. The abdomen is more shining than opaque. First pair of spots reach the margin in full width and the yellow extends forward along the margin, narrowly, to the slightly yellowish sides of the first segment. The two following bands are moderately attenuated laterally, and slightly notched in the middle posteriorly. The bands have a slight metallic greenish lustre, but are distinctly yellowish red.

One specimen, Orillia, Ontario, 1914 (Curran).

This species is very similar to *S. nitidicollis*, but the latter lacks the black orbital stripe below the eyes and the scutellum is black haired, except the base. The specimen described above agrees very well with a var. of *S. nitidicollis* mentioned by Verrall, but differs in the abdominal bands being attenuated laterally and in having the black stripe below the eyes. It may be distinct from *ochrostomus*.

***Syrphus nitidicollis* Meigen.**

This species is moderately like the specimen I have described under *S. ochrostomus*. It is readily distinguished from other North American species by its red antennæ and metallic greenish reddish cross-bands, which are scarcely notched medially and extend over the margins in their full width,

entirely yellow anterior tarsi and black haired scutellum.

One specimen, Orillia, Ontario, 1914 (Curran).

Syrphus genualis Williston.

Face with oral margin, cheeks and median stripe shining black. Second and third abdominal bands narrow, straight, and not attenuated laterally, but extending over the margin in practically their full width. Hind legs blackish or brownish, except the base and tip of the femora and base of the tibiæ.

Williston described this species from a female taken at the base of Mount Washington, N.H. I believe that specimens recorded as this species from British Columbia must belong to the following species.

Syrphus rectoides new species.

Eyes bare, median facial stripe and cheeks black or brownish black; squamæ not pilose above.

Length 8 to 9 mm. Male. Face honey yellow, a broad median stripe, reaching to above the middle, the cheeks and the oral margin broadly, black or brown; face a little retreating; tubercle rather long, more conspicuous below; pile black; frontal triangle shining black, thickly covered with yellow pollen except just above the base of the antennæ, the pile black. Antennæ black, third joint yellow on lower half, almost as broad as long, the end evenly rounded. Vertical triangle black, with black pile.

Thorax cupreous or bluish-black, with yellowish or yellowish brown pile, pleuræ with white pile. Scutellum yellow with black pile.

Abdomen opaque or sub-opaque black, the first segment, sides of the second, sides and apices of the third and fourth, and the fifth segment wholly, shining black. Second segment with a pair of moderately broadly separated sub-oval yellow spots, their inner ends rounded, their outer ends produced forward to the antero-lateral angles. Third segment with a sub-basal fascia, with a small median anterior triangular projection, almost evenly bi-convex posteriorly, and narrowly or not quite reaching the lateral margins. Yellow band on the fourth segment similar, but slightly narrower, apical margins of fourth and fifth segments and basal angles of the fifth, yellow. Pile of abdomen yellowish on basal corners, and the yellow spots, elsewhere, shorter, black.

Legs yellow; basal half of anterior four femora, and the hind legs, except the bases of the tibiæ, brown.

Wings hyaline or slightly darkened; stigma and sub-costal cell pallidly luteous.

Female. Abdominal bands narrower; pile shorter; legs yellow; hind femora with sub-apical band, and the hind tibiæ and tarsi, except the basal quarter of the tibiæ, reddish brown. Otherwise similar to the male.

Holotype, male, Cranbrook, B.C., May 22, 1919, about 3,400 ft.; Allotype, Bull River, B.C., May 20, 1919, 3,500 ft.; Paratypes, two females, Cranbrook, B.C., collected by C. B. D. Garrett. Types in Mr. Garrett's collection, paratype in the author's collection.

Very similar to *S. rectus* Osten Sacken, but readily distinguished by the facial stripe and bare squamæ; allied to *S. quinquilimbatus*, but the legs of the female are yellow basally and the scutellum is lighter; differs from *S. genualis*

in that the bands are attenuated laterally; differs from *S. vitripennis* in the black facial stripe.

TWO NEW CANADIAN CRAMBID MOTHS (LEPID.)

BY J. MCDUNNOUGH, PH.D.
Entomological Branch, Ottawa.*

***Crambus tutillus* sp. nov.**

Primaries deep brown, costa with a faint white line at base of wing only; a rather narrow white stripe subcostally from base of wing to end of cell, broadest near apex and with lower margin toothed on vein 2; veins between apex of white stripe and subterminal line outlined in blackish with a distinct metallic tinge; beyond and just below stripe is an obsolescent white rectangular patch and above it on costa a small white patch preceding the subterminal line; this line metallic, arising from small white costal spot, edged inwardly by a dark shade line and obtusely angled on vein 6; a small¹ white triangular spot below apex of wing and five black dots on outer margin at termination of veins; fringe white at apex and anal angle, metallic in central portion, slightly tinged with brownish outwardly. Secondaries dark smoky with pale fringes. Beneath smoky, paler terminally, with the black terminal dots of upper side of primaries repeated. Expanse 20 mm.

Holotype 1 ♂, Victoria B. C. (May 23rd,) (W. Downes) in Canadian National Collection.

Paratypes 5 ♂'s from same locality, collected between 12th, and 28th, May; in same collection.

The species has been passing under the name *dissectus* Grt., but differs from this species in the reduction of the white stripe and rectangular white patch and the entire lack of white shading along the inner margin. It is probably closest to *dumetellus* Hbn., differing in the much shorter and less distinct white costal line.

***Crambus awemellus* sp. nov.**

Primaries light yellowish brown, paler above inner margin; a narrow white costal stripe, extending two thirds the length of the wing; below this and separated by a brown area a broader and slightly longer white stripe, edged above distally by a dark line and with bluntly pointed apex, terminating shortly before subterminal line; a white rectangular patch extending from just below apex of stripe to outer margin and crossed by subterminal line; veins in postmedian area outlined in white with narrow dark border lines; an oblique white costal streak separated from s. t. line by a small smoky patch; subterminal line white, slightly metallic and rounded outwardly opposite cell, edged inwardly by brown, costa at apex white and a white subapical triangular patch on outer margin; the usual terminal black dots preceded by short white stripes; fringes whitish, especially below apex, metallic outwardly. Secondaries pale smoky with white fringes. Expanse 19-20 mm.

Holotype 1 ♂, Aweme, Man. (Aug. 8th) (N. Criddle) in Canadian National Collection.

*Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

Paratypes 3 ♂s, Aweme, Man. (Aug. 12th, 15th, 18th) (N. Criddle) in Canadian National Collection and Collection Barnes.

The species resembles considerably a miniature *agitatellus* Clem. but the white stripe is narrower and has no tooth on lower margin; the coloration shows less of the ochreous shades found in this latter species. A specimen from South Park, Colo., (Oslar) in the Barnes Collection appears to belong to this species. Worn specimens tend to show a general diffusion of the white areas.

A METHOD OF MAKING PHOTOGRAPHIC PRINTS OF INSECT WINGS.

BY R. P. GORHAM,

Assistant Entomologist, Entomological Branch, Ottawa.

In some work with Diptera it was found desirable to obtain a series of photographs of wing venation in a number of different families. A very convenient, inexpensive and rapid method of making these was found, and, as it seems possible that it may be of use to others, it is herewith described. In brief, it consists of using the insect wing itself as a negative and making an enlarged print.

In making the prints the first step is to mount one, or a number of wings, between two sheets of glass so they may be held flat. Glass microscope slides are found to be of a desirable size. For quick work the wing or wings are placed in position on one slide and another similar slide placed over them and held in place by rubber bands. For a permanent mount to be kept for future use, the wing is mounted in balsam. The slide is then placed in a printing frame at the back of a camera and the latter set up in the window of a dark room in the ordinary way for enlarging. The image is projected on a white screen, which is moved toward or away from the camera until the desired size of wing is obtained. Then the shutter is closed and a sheet of bromide paper pinned on the screen and exposed in the usual way to the light rays passing through the wing and camera lens. With very bright sunlight out-of-doors and using enameled paper, one-half minute to one and one-half minutes has been found sufficient time with the smallest of shutter openings. The time will vary with the intensity of the light and the density of the wing.

For ordinary use a print showing a wing length of three inches is found sufficiently large. All details can be clearly seen in a print of that size, and four such prints can be made on one sheet of 5 in. x 7 in. paper. Prints can be made of any desired size up to the limit of the paper available. In the case of the Culicidæ large prints show the scales on the wing veins clearly.

The method seems well adapted for the study of wing venation in those orders of insects having hyaline wings, as the photo-print is more accurate than an ordinary drawing. All parts are enlarged to such size that they can be distinctly seen without the use of a lens, and the exact position of picture spots and shadings of the membrane is also shown. Another advantage is that a number of wings of different species can be printed together at one time on one sheet of paper for comparison by the eye or by measure—all being enlarged the same number of times.

A few test prints made from lepidopterous wings mounted in Xylol-

Balsam have shown that fairly satisfactory results can be obtained with moth wings which have distinctly dark-colored veins. Since the prints are really negative in character the formation of a clear image of the wing vein is dependent on interference with the free passage of light rays. For this reason the wings of *Ctenucha virginica*, even though covered with dark scales, give excellent wing prints, due to the very opaque structure of the veins.

The use of the wing print in the classroom has been tried on a very small scale, but with good results. Students of systematic entomology had before them specimens of the particular insect they were trying to identify and also an enlarged print of the wing. On the print they were able to see distinctly the particular features of wing venation which the instructor wished them to note and then to locate them by the aid of a lens on the wing of the insect. In cases where a particular feature of wing venation has to be determined, in order to successfully use a systematic key, the enlarged print is useful to both instructor and student. When the particular feature has been once located a marked print can be kept at hand for quick comparison with the wings of other insects which the student is tracing through the systematic key, and in this way the time often wasted in searching for negative characters can be saved and doubtful determinations to some extent avoided.

UNDESCRIBED ERIOPTERINE CRANE-FLIES FROM ARGENTINA (TIPULIDAE, DIPTERA)

BY CHARLES P. ALEXANDER,
Urbana, Illinois.

The following species of crane-flies belong to the extensive tribe Eriopterini. They were included in material collected by Dr. Charles Bruch and Engineer V. Weiser and sent to the writer for determination. The writer would express his gratitude to Dr. Bruch and Senor Weiser for the privilege of examining this interesting series of crane-flies.

Erioptera (Erioptera) cladophoroides, sp. n.

Similar to *E. cladophora* Alexander (Brazil); size much larger; body and legs darker colored.

Male—Length about 4.2 mm.; wing 4.3—4.5 mm.

Female—Length 4.3—4.5 mm.; wing 4.5—5.3 mm.

Rostrum reddish brown; palpi dark brown. Antennæ brown; flagellar segments in the male with elongate verticils. Head buffy, dark gray pruinose.

Mesonotal praescutum light gray with a broad brownish fulvous median stripe, the lateral margins of which are bordered with a series of dark brown setigerous punctures; tuberculate pits large, shiny black, separated by a distance a little greater than the diameter of one, situated entirely within the brown median stripe; pseudo-sutural foveae elongate, brownish black; a conspicuous subquadrate brown spot on the lateral margins of praescutum before suture; scutum light gray, the centres of the lobes light brown; scutellum light gray with a narrow brown median line; postnotum gray. Pleural region gray with a broad silvery gray longitudinal stripe, delimited ventrally and more broadly dorsally by narrow brown stripes. Halteres testaceous. Legs with the coxae

gray pruinose; trochanters testaceous; femora dark brown, pale basally, with three narrow white annuli; tibiae with four black and four white annuli arranged alternately, the latter a little narrower than the former, the apical band white; metatarsi black, the intermediate third white; second tarsal segment white, the apex and remainder of tarsi black. Wings whitish subhyaline, the basal third more grayish; a faint gray suffusion beyond the cord; a narrow dark brown seam along the cord, small brown clouds at *h*, arculus, origin of *Rs*, *Sc*₂, *Sc*₁, tips of the longitudinal veins at the wing-margins; a brown cloud at the fork of *M*₃ plus *Cu*₁, and a conspicuous mark near the wing-base behind vein *Cu*; veins pale, darkened in the infuscated areas. Venation: as in the *annulipes* group; a conspicuous spur near the tip of the strongly sinuous vein 2nd *A* as in *E. cladophora*.

Abdomen brown, the sternites paler. Male hypopygium with two pleural appendages, the outermost profoundly bifid, the outer arm similar to the inner arm but a little shorter, both arms acicular; inner pleural appendage a slender chitinized arm that narrows to the acute blackened point. Gonapophyses slender, the tips blackened and slightly incurved.

Habitat—Argentina.

Holotype, ♂, La Plata, October 13, 1920 (C. Bruch).

Allotopotype, ♀.

Paratopotypes, 7 ♂ ♀, October 13-18, 1920.

Type in the collection of the author.

***Molophilus cladocerus*, sp. n.**

Related to *M. honestus* Alexander; pleural appendage of the male hypopygium heavily chitinized, slightly beyond midlength forking into two subequal acutely pointed branches.

Male.—Length 4—4.2 mm.; wing 4.5—5 mm.

Female.—Length 5 mm.; wing 5.5 mm.

Rostrum and palpi brown. Antennae comparatively short, brown. Head light yellow.

Mesonotum light yellowish brown, unmarked with darker; lateral margins almost white; postnotum darker brown. Pleura testaceous, the dorsal region dark brown, continued to the postnotum. Halteres yellow. Legs with the coxae and trochanters yellow; remainder of the legs dark brown, the femoral bases yellow. Wings with a strong yellowish tinge; veins pale brown, those in the costal region more yellowish.

Abdomen pale brown; hypopygium yellow. Male hypopygium with the apparent ventral appendage heavily chitinized, at a little beyond midlength branched, the inner branch only a little shorter than the outer or principal branch, both branches gradually narrowed to the smooth, acute points; remainder of the hypopygium almost as in *M. honestus*.

Habitat.—Argentina.

Holotype, ♂, Arroyo Famaila, Tucuman, altitude 400 meters, October 18, 1920 (V. Weiser).

Allotopotype, ♀, October 12, 1920.

Paratopotypes, ♂ ♀.

Type in the collection of the author.

Gonomyia (Gonomyella) thiosema, sp. n.

General coloration yellow; centre of the vertex dark brown; mesonotal praescutum with three broad stripes; median sclerite of postnotum broadly dark brownish black; pleura yellow with a narrow dark brown stripe; legs dark brown, the femoral bases paler; wings with a faint brownish tinge; male hypopygium with two flattened pale pleural appendages.

Male.—Length 5 mm.; wing, 4.8 mm.

Rostrum brown; palpi dark brown. Antennal scape sulphur-yellow; flagellum dark brown. Head obscure yellow, the centre of the vertex largely dark brown.

Pronotal scutum brown, yellowish laterally; scutellum sulphur-yellow. Mesonotal praescutum light brown, the lateral margins and humeral region yellow; a small brown spot on the lateral margin of sclerite; three broad dark brown stripes; scutum obscure brownish yellow, the lobes dark brown; scutellum brown, broadly margined with yellow; postnotum broadly brownish black medially, the anterior lateral regions yellow; lateral sclerites of postnotum yellow, the caudal margins brownish black, these areas lying immediately before the halteres. Pleura sulphur-yellow, narrowly striped longitudinally with dark brown; sternites reddish brown. Halteres dark brown, the basal half of the stem paler. Legs with the coxae yellow, the basal half of the fore coxae dark brown; trochanters yellow; remainder of legs dark brown, the femoral bases obscure yellow. Wings with a faint brownish tinge; veins dark brown. Venation; Sc long, Sc_1 ending just beyond midlength of Rs , Sc_2 some distance from the tip of Sc_1 , the latter alone about equal to $r-m$; Rs long, very gently arcuated; r on R_{2+} at about two-fifths its length; R_2 oblique, parallel to ultimate section of R_1 , shorter than R_3 ; petiole of cell 2nd M_2 about equal to cell; basal deflection of Cu_1 a short distance beyond the fork of M .

Abdomen dark brown; sternites obscure brownish yellow. Male hypopygium with the pleurites stout; the proximal face densely set with a cushion of slender setiferous tubercles; apex of pleurite tipped with a short cylindrical lobe that is provided with a pencil of stiff yellow bristles. Two pleural appendages, the outer one very pale and flattened, the apex directed proximad; inner appendage shorter, more chitinated, flattened, on the face with two setiferous tubercles. Penis-guard stout, the apex simple.

Habitat.—Argentina.

Holotype, ♂, Famailla, Tucuman, October, 1920 (V. Weiser).

Type in the collection of the La Plata Museum.

Gonomyia (Leiponeura) misera, sp. n.

Rostrum reddish; antennae black, the enlarged second scapal segment a little reddish basally; general coloration pale brownish testaceous; pleura testaceous yellow; wings subhyaline, unmarked; male hypopygium with the outer angles of the pleurites produced into stout pale spines, the tips blackened and densely covered with short, appressed hairs; penis-guard stout, pale, longer than the remaining elements of the hypopygium.

Male.—Length 3.5–3.6 mm.; wing 3.8–4 mm.

Female.—Length 3.5–3.8 mm.; wing 4–4.1 mm.

Rostrum reddish; palpi dark brown. Antennae black, the enlarged

globular second scapal segment reddish brown basally; flagellar segments with very long verticils in the male. Head with front and anterior part of vertex reddish; remainder of vertex brown; genae and occiput obscure yellow.

Thoracic praescutum testaceous brown, unmarked; posterior sclerites of mesonotum obscure yellow. Pleura testaceous yellow. Halteres pale, the knobs obscure yellow. Legs with coxae and trochanters obscure yellow; remainder of the legs pale brown. Wings subhyaline, unmarked; veins pale brown. Venation: Sc_1 ending far before origin of R_s , the distance from three-fourths to equal to length of R_s ; Sc_2 some distance from tip of Sc_1 ; R_s rather long, nearly straight; cell 1st M_2 closed; basal deflection of Cu_1 at or before the fork of M .

Abdomen light brown, the sternites and hypopygium a little paler. Male hypopygium with the ninth tergite conspicuous, semi-cylindrical, the caudal margin truncated or feebly concave, the lateral margins and angles with numerous short appressed spines; outer angle of the pleurite produced caudad into a stout pale spine which gradually narrows to the acute blackened point, this blackened tip covered with abundant tiny appressed hairs; pleural appendage shorter than this spine, its tip provided with several powerful bristles. Penis-guard pale, very stout at base, tapering to the pale flattened tip; penis-guard exceeding all other elements of hypopygium.

Habitat—Argentina.

Holotype, ♂, Arroyo Famaila, Tucuman, altitude 400 meters, October 12, 1920 (V. Weiser).

Allotopotype, ♀.

Paratopotypes, 8 ♂ ♀.

Type in the collection of the author.

***Paratropeza xystophanes*, sp. n.**

Head and antennae black; mesonotal praescutum yellow with three black stripes; postnotum with the cephalic half obscure yellow; pleura black with a narrow yellowish longitudinal stripe; wings faintly brownish yellow, stigma triangular, dark brown; r near the end of R_s ; abdominal tergites brownish yellow with a narrow, median brown longitudinal line.

Male.—Length 7mm.; wing 8.6 mm.

Rostrum and palpi black. Antennae black. Head shiny black.

Pronotal scutum obscure yellow, indistinctly blackened anteriorly, scutellum yellow. Mesonotal praescutum shiny yellow with three broad shiny black stripes; scutum yellow, the lobes marked with black; scutellum light yellow; postnotum obscure yellow, the caudal half dark brown. Pleura black; a narrow yellowish longitudinal stripe extending above the coxae; a small patch of whitish appressed pubescence above the middle coxae and an extensive area on the metapleura. Halteres dark brown, the knobs conspicuously yellow. Legs with the fore coxae and trochanters obscure chestnut, the remaining coxae and trochanters more yellowish; fore femora brownish black with about the basal third more yellowish; remaining femora more uniformly brownish testaceous; tibiae brown, the tips a little darker; tarsi dark brown. Wings with a faint brownish yellow tinge; stigma triangular, dark brown, surrounding the radial crossvein; a very narrow and indistinct brown seam along the cord and

the outer end of cell 1st M_2 ; veins dark brown. Venation: Generally similar to *P. jactans* Alexander (Brazil); *Rs* more arcuated; *r* close to the fork of *Rs*; basal deflection of Cu_1 a short distance beyond the fork of *M*.

Abdomen shiny brownish yellow, the tergites with a narrow black median line; sternites clearer yellow; hypopygium darkened.

Habitat.—Argentina.

Holotype ♂, Quebrada Famailla, Tucuman, altitude 1,600 meters, October 16, 1920 (V. Weiser).

Type in the collection of the LaPlata Museum.

***Teucholabis omissa*, sp. n.**

Mesonotum obscure yellowish brown with three brownish black stripes; pleura black with a broad yellowish testaceous longitudinal stripe; wings faintly brown; stigma darker brown, subcircular; cell 1st M_2 open by the atrophy of the outer deflection of M_3 .

Female.—Length 5 mm.; wing 5.2 mm.

Head broken.

Pronotum yellow. Mesonotal praescutum obscure yellowish brown with three interrupted shiny brownish black stripes, the median stripe indicated only on the cephalic margin of the sclerite as a shiny area; lateral stripes narrower and less distinct; scutum obscure brownish yellow, the lobes marked with black; scutellum and postnotum obscure brown, covered with a short white pubescence. Pleura black with a broad yellowish testaceous longitudinal ventral stripe, passing beneath the root of the halteres; pleura with a short white pubescence. Halteres brown, the knobs obscure yellowish brown. Legs with the fore coxae dark brown; middle and hind coxae pale brown, whitish pubescent; trochanters obscure yellow; femora obscure yellow, the tips darkened; tibiae brown, the tips darker brown; tarsi dark brown. Wings comparatively narrow, with a faint brownish tinge; stigma darker brown, subcircular veins dark brown. Venation: *Sc* moderately long, Sc_1 ending at about two-fifths the length of *Rs*; Sc_2 lacking; *Rs* long, gently arcuated; *r* a short distance beyond the fork of *Rs*; petiole of cell 2nd M_2 about one-half of this cell; cell 1st M_2 open by the atrophy of the outer deflection of M_3 ; basal deflection of Cu_1 a short distance beyond the fork of *M*.

Abdomen dark brown, the basal sternites obscure yellow. Ovipositor with the basal shield black; valves of the ovipositor yellowish horn-color, strongly upcurved.

Habitat.—Argentina.

Holotype, ♀, Arroyo Famailla, Tucuman, altitude 400 meters, October, 1920 (V. Weiser).

Type in the collection of the La Plata Museum.

Teucholabis omissa is readily told from all described species of the genus, with the exception of *T. omissinervis* Alexander (Peru) by the open cell 1st M_2 .

NOTE ON THE GENERIC POSITION OF TWO CANADIAN
ARCTIIDS WITH DESCRIPTION OF NEW
SPECIES. (LEPID.)

BY J. MCDUNNOUGH, PH. D.,
Entomological Branch, Ottawa.*

In our latest lists following Dyar (1903, List N. Am. Lepid. 87), *yarrowi* Stretch has been placed in the genus *Neoarctia* N. & D. Hampson included it in his genus *Phragmatobia* Steph. (1901, Cat. Lep. Phal. Brit. Mus. III., 242), but the species was evidently unknown to him. An examination of specimens of this rare species in the Canadian National Collection shows that it falls into *Hyphoraia* Hbn. as defined by Hampson, the eyes being hairy and veins 7, 8, 9 and 10 stalked.

The species *alpina* Ques., listed by Hampson as a synonym of *Hyphoraia lapponica* Thun. (*festiva* Bork.) has already been shown to be a distinct species by Mr. Gibson (1920, Rep. Can. Arct. Exp. III., Pt. J, 31.). A further examination shows that it is not even associated generically with *lapponica*, the eyes being non-hairy and there being a distinct areole present in the venation of primaries with veins 7, 8 and 9 stalked from its apex. According to Hampson's keys, *alpina* would fall into *Arctia* Schrank along with *caia* and *villica*; according to maculation it has more similarity with *Platyrepia guttata* Bdv. The genus *Platyrepia* was separated by Dyar from *Arctia* (1897, Can. Ent., XXIX., 212) on the strength of the areole being wanting; this is, however, scarcely correct, for in a majority of specimens of *guttata* examined by me the areole was present and the lack of same is decidedly an aberrant character which cannot be used for generic separation; the smooth thoracic squamation is probably a better means of separation of the two genera. More recently Dyar, in a criticism of the Barnes & McDunnough "Check List" (Ins. Ins. Menst. v. 43), claims that *Platyrepia* should be transferred to the Hypsidae, an Indo-australian group separable from the *Arctiidae*, according to Hampson (Cat. Lep. Phal. Brit. Mus., I., 17), by the fact that vein 8 of the secondaries is not anastomosed with 7, but connected by a cross-bar. The venation of *guttata* Bdv. does not bear out this contention; it is practically identical with that of *caia* L., vein 8 being fused to 7 for almost half the length of the cell. The general type of male genitalia is quite similar in the two species and the larvae also bear a great resemblance to each other. Unless the conception of the family *Hypsidae* has been changed since the publication of Hampson's work, I see no reason why *Platyrepia* should not be retained in its present position in the *Arctiidae* and should strongly incline, on account of the great similarity of genitalia, to place *alpina* Ques. along with *guttata* Bdv. in this genus.

In the Canadian National Collection is a single ♀ collected a number of years ago at Banff, which appears to represent a new species of *Neoarctia*, probably closest to *cervina* Fall. from the Alps. The description is as follows:—

***Neoarctia sordida* sp. nov.**

♀. Palpi pale ochreous; head and front with short black hair, mixed with pale ochreous; legs ochreous; tegulae ochreous with two distinct central black spots; thorax and patagia black, the latter faintly bordered with ochreous;

*Contribution from Entomological Branch, Dept. of Agriculture, Ottawa.

abdomen lacking. Primaries thinly scaled, black; costa and fringes pale ochreous; traces of ochreous along cubitus and vein 1; t.a. line broad, pale ochreous, strongly outwardly oblique from costa to below cubitus, then angled inwardly and oblique to inner margin a little over 1-3 from base. T.p. line broad, ochreous, rounded outwardly below costa and then parallel to outer margin; s. t. line ochreous, rather indistinct; inwardly oblique from costa to vein 6, then forming a prominent W mark, touching t.p. line below veins 4 and 2, and the outer margin at veins 1, 2 and 5. On one side only a small costal spot just beyond t. a. line. Secondaries almost uniformly dark smoky, slightly paler subterminally. Beneath paler than above with costa of both wings scaled with ochreous and a sprinkling of pale scales over entire surface; primaries with maculation of upper side faintly reproduced; secondaries with two fairly evident dark subterminal round spots on vein 2 and between 5 and 6. Expanse 30 mm. *Holotype*, 1 ♀, Banff, Alta. (June 13, 1914) (N. B. Sanson), in Canadian National Collection.

The species is much less hairy in the vestiture of head and thorax than either *brucei* Edw. or *beani* Neum., but by venational characters seems best placed in the above genus.

COSYMBIA LUMENARIA HUB: A CORRECTION.

BY E. H. BLACKMORE,
Victoria, B. C.

In a recent letter from Mr. L. B. Prout of London, England, commenting on some geometrid notes in Ann. Report Prov. Mus. Nat. His. B.C., 1919, he asks me not to use the name *Cosymbia lumenaria* for *C. pendulinaria*, as it is a gross misidentification on the part of the late Dr. Hulst.

Wishing this to be corrected in North American Check Lists, he has given me some notes on the subject which I present in the following form:

- 1832. Geyer in his continuation of Hubner's Zutr. Exot: Schmett. figured as *lumenaria* a species which he erroneously believed to be from North America but which is really East Indian.
- 1895. Hulst in working up the old literature came across this figure and making a guess at identifying it with some North American species, picked on *pendulinaria* as being the same.
- 1896. Hampson (Moths of India, IV., p. 556) found the correct determination of *lumenaria*, sinking his own *Rambara ochreicostalis* in the synonymy.

American authors have, not unnaturally, overlooked this and continued to perpetuate Hulst's error.

In the meantime our American *Cosymbia* had been named *pendulinaria* by Guenée (1857) and this is the oldest name belonging to it.

On looking up Genera. Ins. Fasc. 104, p. 73, I find that *lumenaria* Geyer is placed in the genus *Derambila* Walk. and its distribution is given as India to Malaysia. The apparent discrepancy of authorship is attributable to the fact that Geyer was editor of Hubner's works for a long time and continued them in Hubner's name after the death of the latter. This has given rise to a lot of inconsistencies in citation.

The name of *lumenaria* Hub. will have to be dropped from our North American Lists and *pendulinaria* Gn. will now takes its place.

Mailed Sept. 30th, 1921.

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POPULAR AND PRACTICAL ENTOMOLOGY.

THE CABBAGE SEED STALK WEEVIL (*CEUTORHYNCHUS QUADRIDENS* PANZER) AN IMPORTANT PEST OF CABBAGE SEED PLANTS ON LONG ISLAND.

BY I. H. VOGEL,*

Cornell University, Ithaca, N. Y.

The cabbage seed stalk weevil is a European insect. Panzer (1796)¹ first described the species. Goureaux (1866)² found the larvae living within the roots of rape. Perris (1877)³ reported water cress and mustard as host plants for the larvae. Lind et al (1914)⁴ found it occurring comparatively common in seed cauliflower and turnip in Denmark. According to Redtenbacher⁵ it occurs on rape in Austria and Bargagli⁶ reports it on the flowers of horse radish and cabbage.

Slingerland (1894)¹ reported it first in the United States as infesting cabbage seed stalks on Long Island. It was later reported² from Nantuckett, Massachusetts. Sirrine (1895)³ observed it on seed plants of kale, cabbage and turnip on Long Island. Specimens were sent to Dietz who described it as a new species (*Ceutorhynchus seriesetosus*). Chittenden (1901)⁴ identified specimens for Slingerland as *C. quadridens* Panzer. Schwartz later confirmed this identification.

There is little information in literature regarding the life history of this insect.. Slingerland (1894)¹ reared adults from larvae found in cabbage seed stalks. These adults are the same as were later identified by Chittenden (Preserved in Cornell University Entomological Collection).

During the season of 1920 the author had the opportunity to observe this seed stalk weevil in the cabbage fields in the vicinity of Mattituck, Long Island, N. Y. Eggs were found first in the field on May 18th. They were deposited on the under side of the mid-rib of young and old cabbage leaves. Nearly every plant contained eggs. No larvae were found at this time. Although egg laying continued until May 26th the method of oviposition was not observed. The eggs were laid in punctures, the number in each puncture varying from three to seven. The tissue surrounding the puncture makes very rapid growth, thus forming a very conspicuous scar. The eggs are white, elliptical and about one millimeter in length. Each egg has at one end a slender pedicel which is about one-half millimeter in length. This attachment of the egg is very

¹ Faunae Germanicae, Heft 36, p. 13, 1796.

² Annales de la Societe Entomologique de France, Vol. vi., p. 171-172, 1866.

³ Larves de Coleopteres, 1877, p. 408.

⁴ 79 Beretning fra Staten Forsogsvirksamdid i Plantkulture Copenhagen, No. 30, 1914.

⁵ Fauna Austriaca, Vol. 11, p. 344.

⁶ Ibid, page 264.

¹ Cornell Agr. Exp. Sta. Bulletin 78, 1894.

² Transactions of American Entomological Society 1896, p. 422.

³ New York Agr. Exp. Sta. Rept. 1896, p. 603.

⁴ Notes of Slingerland. Cornell University Exp. No. 455.

*Contribution from the Entomological Laboratory, Cornell University.

fragile. Observations made on material collected showed the eggs hatched in about four days. According to this observation the egg laying period doubtless began at least by May 16th.

The larvae enter the mid-rib through the puncture. They burrow in the mid-ribs and extend their work down to the pith of the branches and main stalk. Instances were observed where more than thirty larvae were found in a leaf mid-rib two and one-half inches in length and one hundred and fifty in a single plant. The larval period occupied about ten days, after which they emerge from the stalk by boring small holes in the side of the stalk or branch. Doubtless each hole serves as a means of escape for several larvae as there are apparently more larvae in a stalk than holes. The larvae drop to the ground and pupate.

The mature larva measures 4-5 mm., legless, white. Head lemon yellow with dark brown tipped mandibles. The body is composed of 12 easily recognized segments, each segment, especially those of the abdomen, is marked with distinct ridges.

Pupation occurs near the surface of the soil in brown, fragile pupal cells made of earthen material. Each cell measures 5mm. in length. The pupal period occupies about ten days. The pupa measures 3mm; white; scattered over the thorax, head, beak and tip of femora are prominent brown spines. These spines serve to keep the delicate pupa from touching the roughened surface of the pupal cell. Shortly after pupation the eyes become jet black. As the pupa grows older it gradually becomes darker.

The adults of the seed stalk weevil were found in the field from June 16 to July 10th. They are rather difficult to observe, due to the minuteness, color and habit of "playing possum" upon the least disturbance. They can be readily observed during the fore part of a still, warm day on the upper branches and in the axils of the leaves of the seed stalks.

Blatchley and Leng give a good description of the cabbage seed stalk weevil in "*Rhyncophora* of North America" p. 443.

The insect undoubtedly hibernates as an adult although no trace of it could be found after it had disappeared from the fields in July.

In general the cabbage seed growers on Long Island either failed to recognize this insect or confused it with the larval stage of the common cabbage maggot (*Phorbia brassicae* Bouche). It is due to this confusion that little information has been secured concerning its distribution and destructiveness in the past.

The distribution of this weevil in the cabbage seed field in the vicinity of Mattituck seemed quite general during the past season. The information collected was taken from a comparatively few fields although characteristic signs of the presence of the insect were seen in nearly every field in that vicinity.

The losses to the cabbage seed grower are due to the larvae burrowing in the pith of the main stalks and branches thus weakening the plant and causing it to break over or die prematurely. In either case the quantity and quality of seed produced by an infested plant is inferior to that of a plant not infested.

In order to learn to what extent the weevil occurs and to determine the losses caused by it, counts were made in five fields. It was found that forty-seven

percent of the plants were injured to some degree. At harvest time one hundred normal plants and an equal number of plants attacked by the insect were threshed. The amounts of seed secured, both before and after cleaning, are given in the following table:

One hundred plants each	Weight of seed before cleaning	Weight of seed after cleaning	Percent of seed lost in cleaning
Not infested	109.2 oz.	97.4 oz.	11
Infested	74.3 oz.	64.8 oz.	13
Loss due to insect		32.6 oz.	

Plants not attacked by the insect therefore yielded practically thirty-three and one-half per cent. more seed than the attacked plants. Since there were forty-seven per cent. of the plants attacked by the insect the loss would be sixteen per cent. of the crop. The seed yield was approximately two hundred and fifty pounds per acre this year, and consequently the loss occasioned by the weevil was forty pounds per acre valued at fifty dollars (1920). Even greater losses have doubtless occurred since a cabbage seed contractor and some growers have cited instances where in previous years this insect has occasioned the loss of entire crops.

NEW SPECIES OF SYRPHIDAE (DIPTERA)

BY C. HOWARD CURRAN,
Orillia, Ont.

***Syrphus invigor*, new species.**

Eyes bare; face yellow, cheeks and oral margin black; no facial stripe; first and third abdominal bands interrupted, the second entire. Length 10-11 mm.

Male. Face and sides of front reddish yellow; cheeks, oral margin and sides of the face, reaching to the tubercle, brownish black, posterior oral border reddish yellow; face finely white pilose and more or less whitish pubescent; tubercle rather large, the epistoma not at all produced; front black in the middle; frontal pile yellowish or sometimes brownish, of the vertex, black, of posterior orbits, white; eyes bare. Antennae reddish yellow or orange, more or less brownish above; arista reddish brown.

Thorax shining greenish black, with pallid yellowish white pile, more yellow along the lateral margins before the suture, and almost white on the pleurae. Scutellum translucent pale yellowish brown the base and sides black; pile whitish.

Abdomen opaque black, the first segment and complete borders of the following segments, the lateral margins more narrowly, shining black, sometimes with a greenish tinge. Second segment with a large triangular spot in the middle on each side; third segment with an abbreviated yellow band moderately separated from the anterior margin, deeply incised posteriorly (about half through) and usually with a small triangular projection in the middle anteriorly; the band is broadest laterally and is narrowly separated from the lateral margins. Band on fourth segment similar, but moderately interrupted in the middle, the inner ends of the spots formed being almost evenly rounded posteriorly to the lateral fourth; apex of third segment in the middle and base of fourth at the sides, narrowly yellow; apex of fourth segment and triangles on the basal

corners of the fifth more broadly reddish yellow. None of the bands reach the lateral margins. Pile yellowish white or white on base of abdomen, rather long; dusky along the margins, the apical half of third to fifth segments with blackish pile laterally; opaque areas, except the base, with shorter black pile; yellow bands with yellow pile. Abdomen rather slender; only a little oval.

Legs reddish yellow; basal half of the front four femora, and three-fourths of the hind femora, an obscure ring on the apical third of the hind tibiae, and the hind tarsi apically, reddish brown. Wings slightly tinged with luteous; stigma and sub-costal cells luteous, and base of wings more or less so. Squamæ bare.

Holotype, male, Orillia, Ontario, May 30, 1920, two *paratypes*, same date, taken by the author, poising above small maple tree in opening in deep woods. Types in author's collection.

***Syrphus americanus* var. *vinelandi* n. var.**

Length 9-10mm. Differs from typical *S. americanus* as follows:

The yellow bands in both sexes are narrower, being not wider than the black.

Female: Hind femora black at the base; front more broadly shining black in the middle, and the width at the vertex apparently slightly less; fifth abdominal segment more black.

Male: The spots above the roots of the antennæ are larger and darker than in most specimens of *americanus*; the black of the cheeks is usually connected to the black facial stripe along the oral margin by a brown or black stripe.

This variety seems to approach *S. nitens* much more closely than typical *americanus*, as the bands are usually more emarginate behind.

30 specimens from Ontario and four from Wisconsin. Types in the Museum of the California Academy of Sciences.

The great difference in the larvæ of the typical species and the variety would seem to indicate two distinct species, but it is impossible to distinguish many males, and even some females have the base of the hind femora only brownish. The larvæ are green with an irregular brownish blotch on the dorsum, while in typical *americanus* they are yellowish brown or grayish brown with very much more numerous small spines.

***Syrphus americanus* var. *pomus* n. var.**

This variety is very similar to the above, but the size is only 7 to 8mm. and the color is darker throughout. The abdominal bands are slightly narrower, the oral margin is more broadly darker and the legs are darker. I can find no good characters for separating the two varieties, but the larvæ are very different.

Larvæ pale grayish yellow, the dorsum more brownish and with somewhat fewer small spines than in typical *americanus*. The larvæ are the only ones I have observed living exposed to the sun. They feed upon *Aphis pomi* but are not abundant.

Holotype and *allotype* in the author's collection.

***Syrphus rubripleuralis*, new species.**

Habitat, California.

Eyes bare; abdomen with only two crossbands, situated on third and fourth segments; sides of abdomen nearly parallel.

Length, 8.5mm. Female. Face dull yellow, the tubercle, oral margin and cheeks reddish brown; in profile gently concave below the antennal prominence to the tip of the prominent tubercle thence somewhat triangularly excavated to the tip of the slightly prominent epistoma; pile fine, sparse, whitish. Antennæ reddish ferruginous, brownish above; arista reddish, rather stout. Front dull black, above, and a central longitudinal area, shining; above the antennae with an arch similar in color to the face and connecting at the sides with the facial ground color; immediately above the antennae, piceous; pile black, rather dense; posterior orbits silvery pollinose. The width at the vertex is about one-third the width at the antennae.

Thorax shining black, the mesopleuræ obscurely reddish posteriorly; pile white, long and silvery on the pleuræ. Scutellum yellow, its base and margin narrowly black, its pile black, and longer than on the thorax.

Abdomen more slender than the thorax, elongate, opaque black, the first segment, anterior third of the second, and the lateral margins of the whole abdomen, shining greenish black; pile long and silvery on the basal two segments, on the lateral margins sparse, whitish or grayish, on the yellow bands yellowish, elsewhere, black, shorter. Third and fourth segments with a narrow, yellowish red band, separated from the anterior margin by about the width of the band, and narrowly separated from the lateral margins; the bands are narrowest in the middle, gradually increasing in width to their ends. In some lights the lateral margins of the apical half of the abdomen appear reddish and the sides of the first segment luteous.

Legs brownish red; base of the front four femora, tips of the tarsi, and the hind legs chiefly, more reddish brown.

Wings hyaline, stigma luteous; spurious vein unusually well developed, rising from the second vein just before the base of the third longitudinal vein and almost united at its apical end with the fourth vein just before the junction of the fourth and fifth veins. Anterior cross-vein almost rectangular and placed about one fourth the distance from the base of the discal cell. Subcostal cell yellow-luteous.

Holotype, female, Mt. Wilson, Cal., Oct. 18, 1917, (E. P. VanDuzee), in the Museum of the California Academy of Sciences.

This species is rather striking and reminds one of *Melanostoma*. If Matsumari's classification were accepted, it would form a new genus near *Syrphus*, because of the position of the anterior cross-vein, and the slender abdomen. Matsumari's genera seem much too artificial to be accepted and I cannot agree with him, therefore I leave the present species in the genus *Syrphus*.

***Sphaerophoria cranbrookensis*, new species.**

Swollen portion of the hypopygium almost circular in outline when viewed from above; terminal plates very short, about four times broader than long, the apical pile not dense, directed forwards, rather long, yellow. Abdomen deep shining black, with reddish yellow bands.

Length, 10mm. Male. Face and front creamy yellow, the middle of the face and oral margin translucent: face with inconspicuous pile, front with short, sparse, pallid pile. Antennae yellow: third joint above, and the arista, black. Vertical triangle with long black pile. Cheeks blackish, a yellow spot below the eyes. Posterior orbits blackish, with grayish pollen and silvery pile on the lower half, yellow pollen and black and yellow pile intermixed on the upper half.

Thorax metallic greenish black, with tawny pile; lateral stripes broad, whitish, to the suture, thence indistinct to the post alar callosities. A spot above the front coxae, a large mesopleural spot and a smaller one below it, and the sterno-pleurae, yellowish white. Scutellum pale yellow, with black pile.

Abdomen shining black, its lateral margins narrowly yellow; second segment with a moderately narrow arched band about the middle, the ends narrowed slightly towards the margin, where it connects with the yellow margin, a small triangular notch in the middle of the yellow band. Third segment with similar, but slightly broader band, except that there is a slight projection posteriorly on each side of the median notch. The third band is much narrower on the lateral quarter, more deeply notched medially, and more produced posteriorly on each side of the notch. Fifth segment yellowish red, with a small median triangular black dash and a large black spot on each side, reaching nearly to the hind margin. Hypopygium as described above.

Legs pale yellowish, with appressed black pile; tarsi reddish.

Wings hyaline. Squamæ yellowish with a blackish or reddish border and short reddish pile.

Holotype, male, Cranbrook, B. C., May 25, 1919, collected by C. B. D. Garrett, in the collection of Mr. Garrett.

***Ceria ontarioensis*, new species.**

Very much like *C. abbreviata* superficially but without the antennal pedicel, and with U's on the third and fourth abdominal segments; differs from *C. signifera* in having black legs and different arrangement of yellow on the face, etc.

Female. Length, about 10.5mm. Face black, with a broad obtusely conical spot on each side below the antennae connecting broadly on the sides with an elongate spot at the orbits which runs downwards towards the oral margin about four-fifths of the distance, the two stripes converging below; above these, small round orbital spots opposite the antennae, an obscure median facial stripe and an obscure arcuate spot on the cheeks, its rounded side towards the front, yellow. Face almost perpendicular in profile, a little convex above the oral margin. Front black, with an interrupted abbreviated, yellow arcuate spot above the antennae in a reddish brown field. Eyes separated by the width of one eye. Posterior orbits black with yellowish pollen bordering the eyes. Pile short, sparse, pale whitish, confined to the cheeks and posterior orbits. Antennae black, the first joint luteous on the basal half. Antennal process oval, very short, luteous about the antennal base.

Thorax dull black, finely scrobiculate, with inconspicuous short black hairs; the humeri, a cordate spot in front of the suture at the sides, a vitula running from the post alar callosities to the suture and curving inwards about

the middle, a small spot inside its anterior end, an elongate spot on the mesopleura and a small roundish one below, yellow, pleuræ shining. Scutellum yellow, its base and sides black.

Abdomen shining black, with short inconspicuous black pile, the fourth segment with yellow pile, and longer yellowish pile on the sides of the basal two segments. Second segment much narrowed basally, forming a rounded sub-carinate swollen area at the base above; on each side with an elongate basal spot. Second to fourth segments with the apices yellow, the anterior yellow band broadest, that on the fourth segment narrowest; in addition, on each side of the third and fourth segments a yellow U, the convexity behind, those on the third segment with the inner arm obsolete.

Legs black; trochanters and base of femora, ends of femora and broad bases of the tibiae and their apices, and the first two or three joints of the front four tarsi, yellow or luteous; femora with double rows of small spines on apical half or quarter.

Wings hyaline, brown in front, more yellowish basally, third vein with a long stump of vein into the first posterior cell about its middle; the brown color extends further into the first posterior cell beyond this stump of vein.

Holotype, female, Orillia, Ontario, May 30, 1920, collected by the author and in his collection.

***Ceria cylindrica*, new species.**

Length, 15mm. Male. Eyes over twice as high as wide; abdomen black, with broad yellow segmental apices and elongate yellow triangular spot on each side of the second segment, reaching almost to the yellow apex.

Male. Face and front yellow, the former separated from the latter by a slightly darker curved line reaching from antennal base to the eyes. Face with a median brown stripe enclosing a narrow yellow line, and the antennal process brown; cheeks shining black, narrowly connected along oral margin with median brown stripe. Face in profile conically produced downwards, very gently convex; the apex of the oral margin is almost as far below the lower border of the eyes as the antennal process is above. Antennal peduncle broadest at apex when viewed dorsally, with a shallow longitudinal median line and a sub-apical depression or groove; not as long as broad; viewed laterally it is slightly longer than broad, being compressed, so that it is about one-third as thick when viewed laterally as dorsally. Antennae opaque brown, third joint opaque black, style yellow, with silvery pubescence, first joint obscurely luteous basally, longer than the second, third joint slightly shorter than the second. Vertical triangle yellow, the ocellar tubercle black; posterior orbits black with yellow pollen along the eyes; pile, only on cheeks and posterior orbits, sparse, yellow, shorter above.

Thorax finely scrobiculate, with extremely short black pile, slightly shining black; the humeri, a spot at each end of the suture, a small, indistinct spot on each side of the middle of the suture; a stripe running from the post alar callosities almost to the suture, the mesopleura and a spot below, yellow, post alar callosities reddish, with yellow pile; pleurae with inconspicuous yellow pile.

Scutellum yellow with a complete border of black, slightly over twice as wide as long.

Abdomen slightly shining black, finely scrobiculate; first and second segments fused, with short black pile on the disc and yellowish pile on the sides; on the sides with an elongate yellow triangle reaching almost to the yellow hind margin, the inner points well separated. Apices of the two following segments increasingly broadly yellow, the yellow on the fourth segment occupying nearly one-third the segment, its anterior angle being bi-convex on each side of the median notch; pile yellow; on each side of the third and fourth segments a moderately prominent gray pollinose stripe reaching from near the median anterior portion of the segment to a point about one-third from the apex and one-fourth from the lateral margins. Hypopygium black, with black pile. In outline the abdomen is slightly narrowed to the apex of the first segment, thence gradually widened to the apex of the fourth, where it is about the same width as at the base. The fifth segment and hypopygium are almost concealed by the fourth segment.

Legs reddish yellow, the last two or three tarsi joints brownish; apical half of hind femora and a broad pre-apical band on the hind tibiae brownish. Wings pale brownish anteriorly, hyaline posteriorly.

Holotype, male, "Faller leaf;—L. Tahoe, Cal., July 15, 1915," (E. C. Van Dyke,) in the Museum of the California Academy of Sciences.

THE CANADIAN SPECIES OF THE GENUS ANOMOGYNA (LEPID.)

BY J. MCDUNNOUGH, PH.D.,
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Omitting the two North American species *infimatis* Grt. and *vernilis* Grt., which may in any case prove to be not strictly congeneric, the genus *Anomogyna* Staud. has been employed by Hampson (1903, Cat. Lep. Phal. Brit. Mus. IV., 588) for a few subarctic European species of Agrotinæ of considerable rarity.

Two of these species, *laetabilis* Zett. and *sincera* H.S., have long been placed on our North American lists as occurring in Labrador, presumably on the strength of H. B. Moeschler's identification, who in his time was in receipt of large collections from this region. To North American lepidopterists, however, the species have remained practically unknown until of quite recent years.

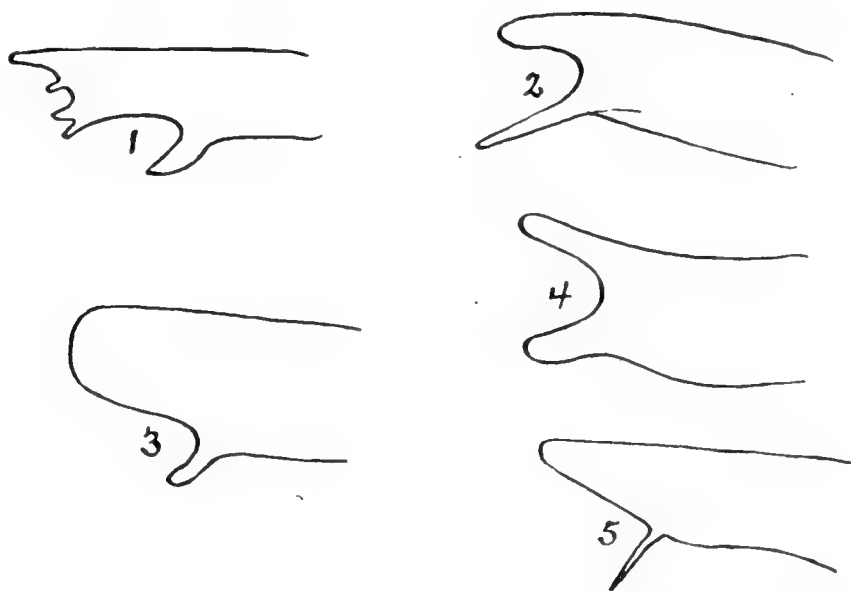
The examination of a series of specimens of this group from the Barnes Collection and that of Mr. K. Bowman of Edmonton, together with specimens contained in the Wolley-Dod and the Canadian National Collections, shows conclusively that there are more species belonging to the group in North America than has been supposed and that these species can be very readily separated from one another by the terminal portion of the claspers (valvæ) of the male genitalia.

As defined by Hampson *Anomogyna* Staud. (type *laetabilis* Zett.) differs from *Aplectoides* Butl. (type *condita* Gn.) in the absence of spines on the fore tibiae. According to the male genitalia there is evidently a close relationship between the species of *Anomogyna* and certain ones included by Hampson in *Aplectoides*, notably *speciosa* Hbn. and *imperita* Hbn., and it is a matter of considerable doubt to me whether in these cases the generic separation will hold;

*Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

in this connection I might mention that while the fore-tibial spines are quite clearly seen in European specimens of *speciosa* and its race *arctica*, in several North American specimens from Mt. Washington, N.H., before me I have been quite unable to detect them although the genitalia present no differences which would indicate specific distinctness.

It is further of interest to note that *Aplectoides* Butl. may possibly fall to *Pteroscia* Morr. (1874, Proc. Bost. Soc. Nat. Hist., XVII., 155). This genus was based on the single species *atrata* Morr. from Mt. Washington, N.H., a species omitted by Hampson in his catalogue and wrongly included under *Agrotis* in the Barnes and McDunnough Check List, 1917, on account of the superficial resemblance to the *unimacula* group. An MSS. note by Dod, who carefully examined the British Museum specimen, states that the species looks like an Alpine *Aplectoides* and is closely related to *speciosa*; this reference I thoroughly agree with after an examination of a ♀ specimen recently received by the National Collection from Larder Lake, Ontario, and which seems to be an undoubted *atrata*. If *condita* and *atrata*, the types of the two genera in question, prove congeneric, *Pteroscia* will have priority. The correct generic relationships of the entire Agrotid group require however a much more detailed study than I now am able to give and I shall confine myself in the present paper to a few remarks on the various species.



Terminal portion of right claspers of (1) *A. partita* n. sp. (2) *A. sincera* H.S. (3) *A. homogena* n. sp. (4) *A. laetabilis* Zett. (5) *P. yukona* n. sp.

***A. sincera* H. S.**

I have recently recorded (Can. Ent. liii., 84) the receipt of a very fine male specimen from Hopedale, Labrador, which is now in the National Collection, through the kindness of Dr. E. M. Walker. It matches so excellently the figure given in Seitz, Macrolepidoptera, Fauna Palaearctica, Vol. III., Pl. XIII. k, that even without European material for comparison I feel reasonably sure of the identification. A single worn specimen labelled Labrador is in the Barnes Collection ex. Coll. J. Doll, and very possibly was the one examined by J. B. Smith in his Agrotid revision, as it is evidently from a German collector and has had a portion of the left clasper removed, as was Smith's custom. Mr. Bowman

possesses a very fine specimen from Nordegg, Alta., and a worn one captured at Pocatontas, Alta.; the species may therefore be expected to occur throughout the entire northern portion of Canada. The terminal dorsal portion of the left clasper is narrow and rounded; the ventral edge is terminated by a long, sharp spine (fig. 2).

***A. laetabilis* Zett.**

Of late years the species has not been rare. It was first reported from Atlin, B.C., by E. M. Anderson, who collected in this region in 1914 (Rep. Prov. Mus. B.C. for 1915, 17, Pl. IX., figs. 9, 10).

Since then numerous specimens have been received by Dr. Wm. Barnes from Okak, Hopedale and Nain, Labrador, and several specimens were collected by Mr. J. B. Wallis, of Winnipeg, in 1917 on the Piquitenay River, Mile 214, Hudson Bay R. R. A very large specimen, rather browner than usual, is contained in the Dod collection from St. Anthony, Newfoundland. Messrs. Bowman and Whitehouse have each taken single specimens in tamarack swamps at Nordegg and Reddeer, Alta., the latter specimen being similar to the Newfoundland one.

These specimens all agree in genitalic characters with a Lapland specimen in the Dod Collection; the distal portion of the clasper is bifid (fig. 4), each prong being bluntly rounded terminally; the ventral prong is generally somewhat shorter and broader than the dorsal one, but there is some variation in this respect.

***A. homogena* n. sp.**

Primaries rather even gray-brown with a slight purplish tinge; a distinct black basal dash reaching $2/3$ to t. a. line; basal half-line geminate, filled with pale gray, indistinct except at costa; t. a. line geminate, gray-filled, outwardly oblique and prominent from costa to proximal end of orbicular, bent inward at cell and then forming two prominent outcurves in submedian fold and above inner margin with inward angle on vein 1; orbicular large, oval, recumbent, filled with pale gray and partially outlined in black in ♂ sex, preceded and followed by black shades in cell; reniform moderate, outlined in black, centrally filled with same shade as the ground color of wing, outwardly with paler ring of color; claviform outlined in black, not prominent; a faint median shade line passing between reniform and orbicular and then bent slightly inward; t. p. line geminate, dentate, pale filled, arising from dark spot on costa above reniform, well rounded outwardly opposite cell and then rigidly oblique to inner margin; s. t. line pale, angled outwardly below costa, then slightly sinuous, preceded below costa by several blackish dashes; similar dashes occur between veins 4 and 6 and slightly below 2; considerable pale gray shading in subterminal area and at apex of wing; broken blackish terminal line. Secondaries deep smoky, paler basally, with large discal spot and traces of curved median line; fringes paler. Beneath smoky with discal spot and curved median line on both wings. Expanse 38-40 mm.

Holotype, 1 ♂, Banff, Alberta, (Sanson), September 5, 1911, in Canadian National Collection.

Allotype, 1 ♀, Pocahontas, Alberta (K. Bowman), August 24, 1918, in Coll. Barnes.

Paratype, 1 ♂, Pocahontas, Alberta (K. Bowman), August 17, 1916, in Coll. Barnes.

A series of five specimens from Nordegg, Alta., is contained in the Bowman collection.

This species has been doubtfully recorded by Wolley-Dod (Can. Ent. XLVII., 7, 1915) under the name *gelida* var. *mevesi* Auriv. I have seen no authentic specimens of this race, but judging by existing figures hardly believe that the two forms are identical. The ♂ genitalia (fig. 3) are quite distinct from those of the two preceding species and closest superficially to those of *Aplectoides speciosa*; the clasper is broad and rounded distally and on the ventral surface a short distance anterior to the apex bears a thumb-like projection considerably larger than the similar projection found in *speciosa*.

Anomogyna (Aplectoides) beddeki Hamp.

Through the kindness of Mr. W. H. Tams of the British Museum I have received a sketch of the clasper of the ♂ type of this species; the terminal portion ends in a rather blunt point with a thumb-like projection on the ventral margin near apex; between this and the end of the clasper there are several irregular projections.

The unique type came from Doyles Cadroy valley, Newfoundland, and it is quite possible that the name *beddeki* will fall to *livalis* Sm. (1910, Jour. N.Y. Ent. Soc., XVIII., 86), also described from Newfoundland. Smith's species is, however, entirely unknown to me and until an opportunity of studying the type is presented it would be unsafe to cite the two names as synonyms. Judging by genitalia I believe I have found a specimen of *beddeki* mixed in with a small series of *speciosa* in the Dod Collection from Grand Gulf, Mt. Washington, N.H. (Swett). The specimen is considerably worn, but shows the small orbicular mentioned by Hampson, which, apart from genitalia, seems the best means of separation from the very similar *speciosa* form of the White Mts.

Five specimens before me from the Rocky Mts. are evidently very closely allied to *beddeki* Hamp. They differ, however, in the lack of any definite white shading on the primaries, especially in the terminal area, being rather uniformly dark olivaceous-gray with the filling of the ordinary spots slightly paler in color than the surrounding area; there is also no evident black basal streak. It is quite possible that these represent merely a western race of *beddeki*, as the type of genitalia is essentially similar, the claspers only differing in the minute detail of the apical margin, which is apparently by no means constant. Until more material is available for study I shall regard the above characters as being of good specific value.

A. partita n. sp.

Squamation rough, hairy. Primaries deep smoky, heavily overlaid, especially in median area, with pale olivaceous scaling amongst which are scattered black scales. Basal half line indistinct, black, bordered outwardly with pale olivaceous; t. a. line black, outwardly oblique and rather irregular from costa to submedian fold, then bent inward and forming a prominent inward angle on vein 1, broadly edged inwardly with pale color; orbicular small,

round, edged with black, pale-filled; reniform semilunate, edged with black, pale-filled; claviform a minute black loop; t. p. line strong, dentate, black, edged outwardly by pale color, bent outward below costa, then rather rigidly oblique to inner margin; s. t. line defined by paler terminal shading and preceded by dark dashes which form opposite cell a distinct dark patch; broken dark terminal line and checkered fringes. Secondaries smoky, paler basally with dark discal dot and traces of curved median line; terminal dark line, slightly broken; fringes pale. Beneath dull smoky with indistinct broad curved median shade on both wings as well as discal dots. Expanse 36-38 mm.

Holotype, 1 ♂, Banff, Alberta (J. B. Wallis), July 4th, in Canadian National Collection.

Paratypes, 2 ♂'s, Kaslo, B. C., July 24th, Aug. 7th (J. W. Cockle), in Canadian National Collection and Collection of Mr. Cockle. 2 ♂'s, Nordegg, Alta., June 23rd, July 20th (J. McDunnough), in Canadian National Collection.

Several other specimens from Nordegg are in the Bowman Collection.

The species is superficially similar to *speciosa* Hbn., but quite distinct in genitalia; in the holotype the distal end of the clasper (fig. 1) is drawn out to four points, of which the dorsal one is longest, and on the ventral margin a short distance from apex the clasper is furnished with a blunt curved projection somewhat similar to that of the preceding species; in the paratypes the middle teeth are reduced to mere knobs and the apical margin is shorter and more oblique, much closer in general appearance to the clasper of *beddeki* Hamp. The fore tibiae show only one or two spines in the distal area.

Among the specimens sent by Dr. Wm. Barnes were two specimens from Upper Ramparts, Yukon Territory, which are quite obviously allied to *atrata* Morr, and which apparently represent a paler, northern race of this species as I can detect no differences in the shape of the terminal portion of the clasper of the two forms.

***Pteroscia atrata yukona* n. var.**

Fore tibiae spined. Thorax an admixture of brown and gray scaling. Primaries rather light purplish-brown, distinctly shiny; maculation rather indistinct; t. a. line slightly darker than ground color, defined inwardly by pale ochreous shading, most prominent as a pale costal patch, slightly dentate in cell, well outcurved in submedian fold, angled inwardly on vein 1; orbicular minute, indistinct, pale-filled; reniform small, narrow, lunate, pale-filled; t. p. line prominently dentate, edged outwardly with pale ochreous, well rounded opposite cell and bent inward in submedian fold, approaching t. a. line closely at inner margin. Several pale dashes on costa between t. p. line and apex of wing and pale terminal dots on outer margin at extremity of veins; fringes concolorous. Secondaries pale smoky with faint discal dot and dark terminal line. Beneath pale smoky, primaries with noticeably darker fringes broken by pale dots, secondaries with dark terminal line; traces of discal dots and bent median line on all wings. Expanse 37 mm.

Holotype, 1 ♂, Upper Ramparts, Yukon Terr. (June 8th, 1917), in Collection Barnes.

Paratype, 1 ♂, Upper Ramparts, Yukon Terr., (July 17, 1917), in Canadian National Collection, through courtesy of Dr. Barnes.

The variety is much paler than the type form, which is purplish-black in color. The ♂ clasper (fig. 5) narrows rapidly at its distal end and bears a strong spine-like projection on its ventral side shortly before apex.

NOTES ON THE MORDELLIDAE OF THE UNITED STATES, WITH DESCRIPTIONS OF NEW SPECIES.

BY EMIL LILJEBLAD,
Chicago, Ill.

Note on sexual dimorphism in the Mordellidae.—Not only in *Tomaxia*, as described by Mr. C. A. Frost,* but also in many (and probably all) the species of *Mordella* and *Mordellistena*, a comb-like series of coarse setae is developed in each anterior femur of the male only. In all Mordellidae studied by the writer in this regard, the males are somewhat smaller and notably slenderer than the females. In at least two species of *Mordellistena* (*M. syntaenia* and *M. pulchra*, as described below), there exists a sexual difference in the number of tibial ridges. In some species of the family, for example *Mordellistena pulchra* (q.v.), the sexes further differ in color.

1. *Diclidia inyoensis*, sp. nov.

Body elongate, nearly parallel in the male, more robust in the female; finely transversely-strigate. Head dark reddish-brown, mouth-parts fusco-testaceous, dark brown palpi excepted; eyes black; antennae reddish-brown, a little lighter toward the base; prothorax and elytra dark reddish-brown; under surfaces dark brown, except the prosternum in the male, which is much lighter in color; legs testaceous in male, fusco-testaceous in female. Eyes granulate and rather deeply emarginate. Antennae with the first and second joints about equal in length, each one-fourth shorter than the third, which is a little shorter than the fourth, in the male; the third and fourth joints equal in the female, of about the same length as the second; sixth to tenth joints in both sexes about equal, each widening toward apex, and each shorter than the fifth; eleventh joint pointed at tip, twice as long as the tenth. Prothorax one-third wider than long, widest at base, its sides rapidly converging to apex, mesosternum compressed and slightly elevated; elytra as wide as thorax at base, rather abruptly rounded at apex, especially in the male; sixth ventral segment visible. The males have on each side of the oedeagus a rather long flattened, triangular appendage, rounded at apex, and with several setae (this, however, can only be seen if the genital organ is extruded). Length of male, 2mm.; of female, 2.25 mm. Breadth of male, 0.75 mm.; of female, 1.0 .

Eight specimens examined, all from the Inyo Mountains, California, at an elevation of 7,000-9,000 feet; collected on July 7-11 by Prof. H. F. Wickham. The male holotype and female allotype are deposited in the writer's collection; paratypes in the collection of Prof. H. F. Wickham, from whom the specimens were received.

This species somewhat resembles *Anthobates fuscus* Lec., but the antennae are longer and the third and fourth joints are about equal in length, the fourth not being reduced in size as it is in *Anthobates*.

*Ent. News, XXIV., 1913, p. 127.

2. *Diclidia gilva*, sp. nov.

Body subcuneate, nearly parallel; color entirely fulvous, except on the black eyes and the fuscous abdomen, finely transversely-strigate. Head comparatively large; eyes coarsely granulate and rather deeply emarginate. Antennae with the second joint a little shorter than the first; the third and fourth equal in length, each about as long as the first and second together; the fifth one-third shorter than the fourth; the sixth a little shorter and wider than the fifth; the eleventh joint twice as long as the tenth. Prothorax about one-third wider than long, as wide as the elytra at base; its sides converging toward the apex; mesosternum compressed and much elevated; elytra slightly tapering toward the apex and rounded at tip; sixth ventral segment visible, nearly truncate, or very slightly emarginate at apex. Two short and narrow appendages, pointed at tip, and covered with comparatively long setae, developed at tip of abdomen, presumably part of the oedeagus, as in *Diclidia inyoensis*. Length 2.5mm., breadth 1 mm.

Two specimens examined, both males, collected on the Inyo Mountains, California, at an elevation of 7,000-9,000 feet, on July 7-11, by Prof. H. F. Wickham.

The type is in the possession of the writer, the paratype is in the collection of Prof. H. F. Wickham.

This species is most closely related to *Diclidia greeni* Liljeblad,¹ from which it differs slightly in size and color, and notably in the shape of the abdominal appendages.

3. *Mordella pubescens*, sp. nov.

Body moderately elongate, very slightly cuneiform; entirely covered with rather coarse, stiff, sericeous-cinereous pubescence. Ground color mostly black, but the elytra with a double whitish spot, located at one-third the distance from apex to base. Head very finely punctate. Antennae short, not reaching middle of prothorax; third joint one-fifth longer than the fourth; the fifth, one-fifth longer than the fourth, but nearly twice as broad at apex, being strongly clavate; the sixth to tenth joints about equal in length, each being one-fourth shorter than the fifth, and strongly clavate; the eleventh joint one-third longer than the tenth, its sides slightly converging toward the apex. Last joint of maxillary palpi an isosceles triangle. Prothorax one-third broader than long, a little broader than the elytra at base; evenly rounded from base to apex, its hind angles obtuse, finely punctured, slightly canaliculate in the middle near the apex and with a very faint fovea each side of it; its base in front of scutellum very broadly rounded; scutellum triangular; under surfaces finely punctured. Anal style very short, comparatively broad, and blunt at tip. Length to end of the elytra 6 mm., to tip of the anal style 7 mm.

One specimen only, presumably a male, from Littleton, Colorado, collected on June 4 by Mr. C. A. Frost.

This species is most nearly allied to *Mordella quadri-punctata* Say., from which it differs markedly, in the much shorter form, and in the color of the elytral pubescence, which is brownish in *M. quadri-punctata*.

¹ Can. Ent. L, 1918, p. 153.

4. *Mordella obliqua* Lec.

The writer is of the opinion that this species, being valid, was wrongly placed by Smith² in the synonymy of *M. lunulata*. Three specimens agreeing closely with the original description³ have been examined; two of these are topotypes, collected by Mr. H. Dietrich at Odenton, Maryland, on June 16; the third was collected by Mr. T. H. Hubbell at Sawyer Dunes, Berrien County, Michigan, on July 9. These three differ from specimens typical of Helmuth's *lunulata*,⁴ in the form of the body, and of the anal style; in the relative lengths of the antennal segments; in the character of the pubescence, and in the marking of the elytra. As originally stated, *M. obliqua* bears considerable resemblance to *M. marginata*.

Mordella obliqua may be redescribed, on the basis of the material at hand, as follows:

Body short, elongate-oval in form. Color as originally described, except that the pubescence of the under surfaces is cinereous, and that the pubescence at the sides of the abdominal segments and of the pygidium is silvery; antennae and palpi, dark brown, palpi the lighter of the two. Antennae with third joint very little shorter than the fourth, and less dilated at apex; fifth joint one-third longer than the fourth and twice as broad at apex; sixth to tenth joints each about one-fourth shorter than the fifth, all moderately serrate. Last joint of maxillary palpi with the inner and outer sides nearly equal in length, the basal side one-half shorter.

5. *Mordellistena quadrinotata*, sp. nov.

Hind tibia with two oblique parallel ridges, the anterior one extending entirely across the outer face of the tibia; first joint of hind tarsus with three, second with two ridges; all ridges strongly marked.

Form nearly linear. Head testaceous, sparsely covered with cinereous pubescence; antennae testaceous, becoming a little fuscous on the four terminal joints; palpi a little darker than the head; eyes black; prothorax black with long flavo-testaceous pubescence, and a small ferruginous spot at the apical angle on each side; elytra black, with an oblique, oblong oval testaceous spot, extending from the humeral angle one-third of the distance to tip of elytra, but not reaching the suture, and one small pale spot, located in the middle of each elytron, one-third of the distance from its apex to base; surface of elytra covered with long stiff flavo-testaceous pubescence; under surfaces black, except on the two last segments of the abdomen (which are testaceous), with pubescence like that of the elytra; anterior legs testaceous, femora and tibia of posterior legs black, the tarsi fuscous; anal style testaceous. Head a little narrower than the prothorax, finely punctured. Antennae filiform; covered with bristle-like hairs; the first and second joints equal in length, rather robust; the third and fourth joints each one-third shorter and a little narrower than the second; the fifth to tenth joints about equal in length, each one-third longer and wider than the fourth; eleventh joint oval, longer than the tenth. Palpi with the last joint nearly oval. Prothorax finely and sparsely punctured; about as long as wide, widest a little in advance of the base, which is truncate in front of scutellum; its sides slightly

² Trans. Am. Ent. Soc. X, 1882, pp. 81, 83.

³ Proc. Amer. Philos. Soc. XVII., 1878, p. 428.

⁴ Specimens examined from Iowa, Illinois, Ohio, Maryland, New Jersey, New York and Massachusetts.

converging toward the apex. Elytra nearly parallel on anterior two-thirds, tapering thence to apex; rather coarsely scabrose over the entire surface; anal style 3 mm.

A single specimen, presumably a female, collected by the writer at Miller, Indiana, on August 29, retained in the writer's collection.

This species seems most nearly allied to *Mordellistena semiusta* Lec., differing in having the prothorax black, with a small ferruginous spot on the apical angle; in having the humeral spot on the elytra distinct, and in the development of a subapical pale spot. It should be listed immediately following *Mordellistena ustulata*.

6. *Mordellistena syntaenia*, sp. nov.

Hind tibia with two ridges in male, with three in female; first joint of hind tarsus with three, the second with two ridges in both sexes; all ridges short and somewhat indistinct.

Body linear. Head black, with rather long and coarse sericeous-cinereous pubescence; antennae black, with the four basal joints fusco-ferruginous; mouth-parts fusco-ferruginous; prothorax black, with rather long coarse sericeous pubescence; elytra black, each elytron with two sericeous-cinereous stripes or vittae; one located near the suture, widening basally and there dividing to enclose a narrow black streak in the center; the other vitta narrow, located near the margin, connected with the first at the base and apex, enclosing a broad black space on the disc, and leaving the suture and lateral margin black; under surfaces black, covered with cinereous pubescence; anterior legs ferruginous, becoming fuscous on apex of the femora and tarsi; middle legs a little darker; posterior legs black, becoming ferruginous on the tibial spurs. Head a little narrower than thorax, closely and finely punctured. Antennae filiform, reaching nearly to base of thorax; the first and second joints equal in length; the third a little shorter than the second; the fourth one-third longer and a little broader than the third; the fifth one-third longer and a little broader than the fourth; the sixth to tenth joints about equal in length; the eleventh longer than the tenth. Apical joint of maxillary palpi securiform; prothorax about as long as wide, its base as wide as that of the elytra, widest at middle, its sides evenly rounded and slightly converging to apex; base truncate or very slightly emarginate at middle; elytra widest at middle and slightly tapering to apex, finely and closely punctured. The inner edges of the femora and tibiae of the anterior legs bear long erect setae in the male, but only fine hairs in the female; inner spur of posterior legs one-third longer than the other. Anal style long and slender. Length to end of the elytra 3 mm., to end of the anal style 4 mm.

Twenty-three specimens examined: nine from Duxbury, Mass., June 27; four from Framingham, Mass., June 3 to July 4; six from Sherborn, Mass., May 25 to June 22; one from Natick, Mass., June 20; two from Southboro, Mass., June 9, and one from Dummerston, Vt., July 14, all collected by Mr. C. A. Frost. The male holotype and female allotype, from Duxbury, Massachusetts, are placed in the writer's collection; paratypes in the collection of Mr. C. A. Frost.

The species is unlike all other North American forms of the genus, being

readily distinguishable by the elytral markings and the ferruginous anterior legs. The ridges on the posterior legs vary much in size, in many specimens being small and faintly indicated; some specimens show slight indications of rudimentary additional ridges.

On account of the sexual difference in the number of ridges, the writer suggests that this species be placed in taxonomic sequence after *Mordellistena inornata*.

7. *Mordellistena incommunis*, sp. nov.

Hind tibia with three rather strongly marked oblique ridges; first joint of hind tarsi with four, the second with three, small oblique ridges.

Body linear, slightly cuneiform. Color black, showing in certain lights a blueish-green iridescent lustre; head and prothorax rather sparsely covered with yellowish-brown pubescence; antennae black; elytra with golden-yellow pubescence along the suture, and on a rather broad vitta on each elytron, extending from near the humeral angle to a little beyond the middle; under surfaces black, with sparse yellowish-brown pubescence; legs black. Head a little narrower than prothorax, finely punctured; eyes small. Antennae filiform, or slightly serrate; third joint one-fourth shorter and a little narrower than the fourth, fifth to tenth joints nearly equal in length and width, each being very little longer than the fourth; eleventh joint elongate ovate, one-fourth longer than the tenth. Maxillary palpi scalene-triangular. Prothorax finely punctured, as broad as long; widest one-fourth the distance from base to apex; slightly rounded and converging toward apex; the base at middle (in front of scutellum), truncate; scutellum triangular; elytra very little wider than the prothorax, widest at middle, and slightly tapering toward apex; moderately punctured. Inner edge of femora and tibiae of anterior legs with long setae in the male, finely pubescent in the female. Anal style long and very slender, with cinerous pubescence at base. Length to end of the elytra, 3.5 to 4 mm., to end of the anal style 4 to 5 mm.

Four specimens examined: one from Riverside, near Chicago, Illinois, collected on June 27 by Mr. C. Sellinger; one from Sawyer Dunes, Berrien County, Michigan, collected by Mr. T. H. Hubbell, and two from Aweme, Manitoba, Canada, collected on June 19 by Mr. Norman Criddle. The male holotype from Riverside, Ill., is deposited in writer's collection; the female allotype from Sawyer Dunes, Berrien Co., Mich., will be placed in the Museum of Zoology, University of Michigan; a paratype in Mr. Criddle's collection.

This species somewhat resembles *Mordellistena suturella* Hel., but differs in having the fourth to tenth antennal joints much shorter, and slightly serrate, rather than elongate-parallel, and in coloration *suturella* shows no trace of a vitta on the disc of the elytra. It should be placed after *Mordellistena aequalis*, *M. conformis* or *M. pulchra*, all of which have same number of ridges on hind legs.

8. *Mordellistena pulchra* Liljeblad.

Since the publication of the original description⁵ of this species, the writer has collected twenty-five additional specimens, including males, which have not been described.

⁵ Can. Ent. XLIX., 1917, p. 12.

These specimens were taken from flowers of *Helianthus*, on August 17 and September 6, at Edgebrook, Illinois, near the type-locality of the species.

The two sexes differ very markedly in several respects. The ridges are alike in the two sexes, except that the second joint of the hind tarsus bears two, rather than three, oblique ridges; in some males a rudiment of the third ridge can be distinguished. The males are somewhat darker in color than the females; the prothorax is ferruginous rather than rufous; the median black line is shorter, being restricted to the posterior half of the prothorax; the elytral vitta is narrower and fainter, in some specimens being apparent only at base of the elytra. The inner edge of the anterior femora in the male only bears setae. The males are somewhat shorter and notably slenderer than the females.

NOTES ON THE GENUS *GARYPUS* IN NORTH AMERICA. (PSEUDOSCORPIONIDA—CHELIFERIDAE.)

BY JOSEPH C. CHAMBERLIN,
Stanford University, California.

In studying a small collection of these interesting arachnids from the California Academy of Sciences, kindly loaned through the courtesy of Dr. E. P. Van Duzee, I discovered a large *Garypus* from Lower California which is apparently undescribed. There were also representatives of *Chelifer* and *Chelanops* which I believe likewise to be new and will describe in a later paper.

To Mr. G. F. Ferris of Stanford University, for his always willing, kindly criticism and help in preparing this description I wish to extend my sincerest thanks.

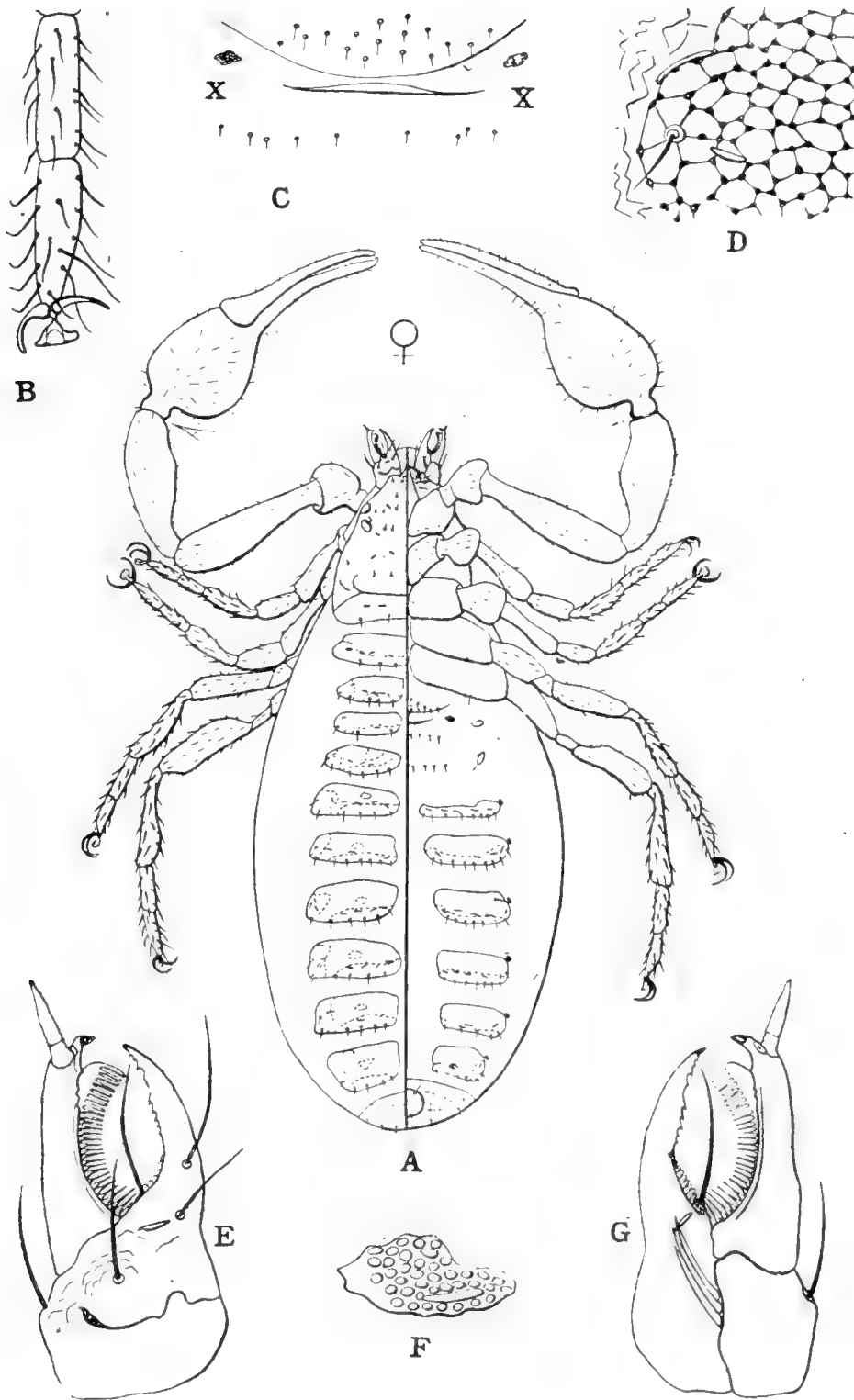
Garypus giganteus, sp. nov.

Female—(Fig. A) *Measurements*. A large species measuring 7.5 mm. in length, including chelicerae. Other measurements may be tabulated:

Anterior margin of cephalothorax37 mm.
Posterior margin of cephalothorax	1.50 mm.
Length of cephalothorax (exclusive of chelicera)	1.60 mm.
Pedipalps (including coxa)	6.55 mm.
First leg (including coxa)	3.50 mm.
Second leg (including coxa)	3.55 mm.
Third leg (including coxa)	4.40 mm.
Fourth leg (including coxa)	5.10 mm.
The length of the individual palpal joints are: coxa, .5 mm.; trochanter, .5 mm.; femur, 1.75 mm.; tibia, 1.5 mm., and claw, 3.3 mm.	

Color. (Alcoholic)—Generally light brownish. Fingers reddish brown; hand light reddish yellow. Remainder of palpi and also legs, light pale brownish. Cephalothorax brown. Abdominal scutae light brown with central darker spot. Ventral abdominal plates light brown; only last seven pairs being visible as the rest are unchitinized and soft. Intersegmental parts and areas surrounding the operculum, very pale brownish.

Morphological characters. *Pedipalpi* moderately long and slender, sparsely clothed with minute simple hairs; fingers distinctly curved, terminated by a stout tooth and provided along their length with a row of minute teeth or serrations. Hand very convex on the inner margin and shorter than the fingers.



GARYPUS GIGANTEUS, NEW SPECIES

(See Page 191)

Tibia about half the width of the hand, convex on its inner edge, but with a gentle concavity at its distal end. Femur not quite so wide as tibia and about the same length, the inner margin being almost straight. Trochanter almost globular.

Chelicerae—(Fig. E, G). Spinnerets long and almost conical in shape, apparently unbranched, although owing to the method of mounting such branching may have been lost. There appears to be a slight constriction or suture near the base. In the type there may be seen running up the movable finger into the spinneret two and possibly three slender ducts, which are presumably from the silk glands. At the base of, and slightly anterior to, each spinneret is an alveolus from which a seta originally arose but which is lost in the type. The serrula consists of about thirty teeth of which the proximal are longest. Fixed finger with nine small teeth exclusive of the hard chitinized tip. The "fixed finger serrula" is present but rather inconspicuous. On each side of the base appears a prominent "stoma." (See remarks).

Cephalothorax—Rather small, sub-triangular, cephalic border emarginate with an indistinct suture or furrow behind the eyes, which are very bright and prominent. Carapace very finely granulate, sparsely covered with minute hairs and bearing a number of small stomata. On either side of the labium is an irregular group of five good sized bristles or setae. The legs are each composed of seven segments; coxa, first and second trochanters, femur, tibia, metatarsus and tarsus. All segments of the legs except the last three are in each case sparingly clothed with fine hairs, but on the last three segments occur numerous stout setae which are more or less regularly arranged. The claws are long and simple and the empodium prominent. (Fig. B.)

Abdomen—Large and evenly rounded. The scutae, with the exception of the first and last are widely divided by a longitudinal median strip and broad intersegmental areas. The last scuta is not only entire but is continuous with the last ventral scuta as well. All these plates are more or less unevenly chitinized and it is due to this fact that their characteristic patterning appears; the areas of heavier chitinization appearing darker than the rest. (See dotted areas of heavier chitinization in fig. A.) The posterior border of each scuta bears a row of from three to eight short, simple setae and anterior to, and roughly parallel with them occurs a row of from three to eight small stomata. The ventral plates are generally smaller and more weakly chitinized than the dorsal ones and the patterning is also different. Only the last seven pairs are visible, the others being indicated by the rows of setae and the very prominent spiracles. Plainly visible at the anterior distal corner of each ventral scuta except the last are the vestigial stigmata. Just inside the anal opening are two pair of small setae.

Skin—(Fig. D). The structure of the skin forming the scutae is very distinct and gives a very characteristic reticulated appearance.

Operculum—(Fig. C.). Just anterior to the genital slit are three rows of short simple setae which probably indicate the first two abdominal segments. Posterior to the opening is a very long narrow chitinized area, then two separate rows of setae and finally the first of the visible plates. The most distinctive

character of this area is, however, the presence of the well marked "cribriform plates." (Fig. A).

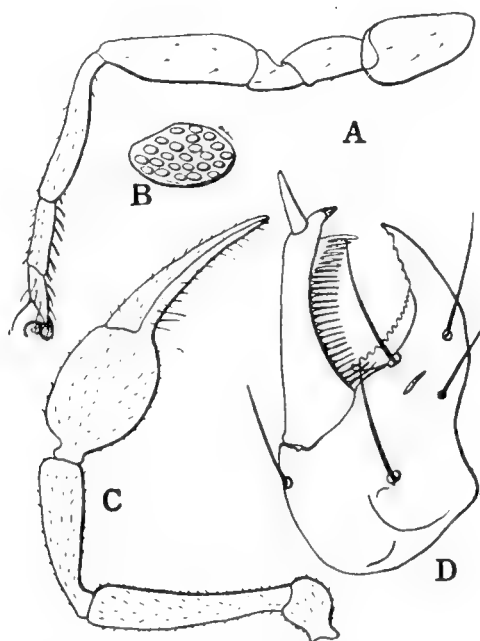
Cribriform Plates—(Fig. F). In this species the cribriform plates are roughly oval or diamond shaped, with about thirty-four "pores" and in addition a small stoma on the posterior edge.

Affinities. This species is rather close to *G. californicus* from which it may readily be separated by its larger size as well as numerous other characters as may be seen by comparing with the brief redescription of the latter species.

Material. A single adult female from Turtle Bay, Lower California, Mexico, collected by the U.S.S. Albatross, April 20, 1906, and deposited in the collection of the California Academy of Sciences, San Francisco, California.

Remarks. The type is mounted on a slide in canada balsam and was first boiled in KOH and stained. Mounting specimens in this way is apt to destroy the shape of the spinnerets, but the numerous characters which are gained more than offset this handicap. Many of the features noted in the preceding description are invisible or practically so in any other form of mount.

In the above description I have used several terms which it might be well to explain. The "fixed finger serrula" referred to is a serrula-like set of transparent teeth or serrations extending from the large seta at the junction of the two fingers along the keel of the fixed finger almost to the basal tooth. I have been unable to find any former mention of this character. It also appears in *G. californicus* where it is very prominent. Its occurrence is very probably generic as is also the characteristic arrangement of the five large dorsal setae. (Figs. E, G and text fig. D).



Garypus californicus (Banks). Female.

A—Third leg. B—Cribriform plate. C—Pedipalp. D—Dorsal aspect of chelicera.

At the base of the fixed finger of the chelicerae on both dorsal and ventral sides, is a long slit-like opening, which, from its resemblance to a superficially similar structure in plants, I have termed a "stoma." These stomata are characteristic of all the species of the order which I have studied and are to be found almost anywhere on the chitinized areas of the body, but more particularly on the abdominal scutae. What they really are I have been unable to discover.

but possibly the openings of lyriform organs or, perhaps, glands. While characteristic of all the species they vary greatly in size, number and position according to the species. They are very probably variable within certain limits in the species also, at least I would suspect so judging from studies of *Chelifer scabriculus* and *C. fuscipes*.

The structures which I have referred to under the term "cribriform plates" are small chitinized plates which are apparently perforated with numerous pores. They occur near the genital slit of the *females* of various species in the family Cheliferidae and vary greatly in size, shape and degree of chitinization. I have found them most prominent in *Chelifer scabriculus* where they are almost perfectly round and rather close together. Whether they occur in other families I cannot say as I have not seen enough material to judge.

Garypus californicus (Banks).

1909—*Garypus californicus* (Banks), Can. Ent. 41:305.

1911—*Garypus californicus* (Banks), Pom. Jour. Ent., 3:635:f210-B.

1917—*Garypus californicus* (Banks), Moore. Jour. Ent. Zool., 9:26:1.

Pedipalps—(Text fig. C). Palpi have almost same proportions as in *G. giganteus*, but the inner margin of the hand is not so swollen, the inner margin of the tibia is straight as is also the inner margin of the femur.

Chelicerae—(Text fig. D). The spinnerets are long conical and as in *G. giganteus* apparently unbranched, the serrula has about twenty-five teeth, the fixed finger is very strongly curved, and the fixed finger serrula is very prominent, having about twelve or thirteen teeth.

Cephalothorax and legs—(Text fig. A). Cephalothorax sub-triangular with anterior border emarginate. Legs as in *G. giganteus* all composed of seven segments. In this species the tarsal bristles are arranged in regular rows. The change from sparsely scattered fine hairs to these tarsal setae takes place at the metatarsus, unlike *G. giganteus* where the transition is at the tibia.

Abdomen—Much the same shape as in *G. giganteus* except that all the ventral scutae are slightly more chitinized. The cribriform plates (Fig. B) are oval in shape, with about twenty-three pores and no stoma.

Material. An adult female from the type locality; Santa Clara County, California.

Remarks. In several places I have noticed descriptions of species in this genus where the fact is mentioned that the second trochanter is present in the posterior pair of legs, inferring that they were missing in the two anterior pair. I think this is a mistake as in both these species the number of segments is the same in all the legs.

OTHER NORTH AMERICAN SPECIES.

Two other species of this genus are described from North America. These are *Garypus floridensis* and *G. granulatus*, both of which were described by Dr. Nathan Banks. The four North American species may be separated by the following key, which is based in part upon the literature.

1. Anterior margin of cephalothorax emarginate, fingers as long or longer than hand, length 4 mm. or greater 2
- Anterior margin of the cephalothorax not emarginate, fingers shorter than

- hand, length 1.7 mm. *granulatus* (Banks)
2. Fingers about as long as hand, length 4 mm. *floridensis* (Banks)
Fingers distinctly longer than hand, Pacific Coast species 3
3. Inner margin of tibia straight, fixed finger of chelicera strongly curved,
fixed finger serrula very prominent, cribriform plate of female oval in
shape and lacking a stomata, length 4.5 mm. *californicus* (Banks)
Inner margin of tibia convex, fixed finger of chelicera almost straight,
fixed finger serrula inconspicuous, cribriform plate of female roughly
angular with a small stoma present, length 7.5 mm. From Lower
California. *giganteus* sp. nov.

***Garypus floridensis* (Banks).**

1895—*Garypus floridensis* (Banks), Journ. N. Y. Ent. Soc., 3:9.

This species was described from near St. Lucie, Indian River, Florida, where it was collected under drift-wood on the ocean beach.

***Garypus granulatus* (Banks).**

1891—*Garypus granulatus* (Banks), Can. Ent., 23:163.

1895—*Garypus granulatus* (Banks), Journ. N. Y. Ent. Soc., 3:9.

This small species was discovered in the crevices of a cliff at Ithaca, N.Y.

EXPLANATION OF PLATE VII.

- A—Left half dorsal; right half ventral.
B—Dorsal aspect of tarsus of second leg.
C—Operculum.
D—Distal corner of third dorsal scuta.
E—Dorsal aspect of chelicera.
F—Cribriform plate.
G—Ventral aspect of chelicera.

***SAMIA EURYALUS* BDV., THE CORRECT NAME FOR THE
CALIFORNIAN SILK WORM MOTH.**

BY J. MCDUNNOUGH, PH. D.,*

Entomological Branch, Ottawa.

A curious error has crept into the synonymy of the well-known *Samia* species of California and the Pacific Coast which, for the past fifteen years, has been generally known as *Samia rubra* Behr.

The species was first mentioned by Dr. Behr at the meeting of the California Academy of Sciences held April 30th, 1855, and is reported in the Proceedings of that Society, Vol. I, p. 47 (Edition of 1873, p. 46) as follows:—"Dr. Behr presented a drawing of a native silk-worm of California with a specimen of the cocoon and the following description: *Saturnia rubra*, collare album, etc. It is found on the *Ceanothus thrysiflorus*" Owing to an oversight of the author or of the printer, no actual name for the species was proposed, the adjective "rubra" being merely part of the Latin diagnosis (as can be readily seen by the difference in type) and by no means to be employed as the name of the species. Dr. Behr several times expressed himself to this effect in letters to contemporary entomologists.

*Contribution from the Entomological Branch, Dept. of Agr., Ottawa.

On pages 68-69 (72 of Edition II.) of the same Proceedings, we find this note under date of Aug. 27th, 1855:—"Donations to the Cabinet. From Dr. Behr a specimen of the Cal. silk-worm (*Saturnia ceanothi* Behr)." There is no doubt as to the application of the name nor, I think, to its validity; the name *ceanothi* Behr cannot, however, under the most favorable conditions, be considered to have been published prior to the first week of September, 1855.

Meanwhile, in the Bulletin Soc. Ent. France for 1855, p. XXXII., we find recorded that Dr. Boisduval exhibited certain Californian Lepidoptera which he proposed describing at a later date; the name of each species, together with a very short diagnosis, was given, sufficient, however, I believe, to establish the validity of the names. Among the species mentioned was *Saturnia euryalus*, which is obviously the same species to which Behr applied the name *ceanothi*, in fact in Lep. de la Californie, p. 83, 1869, Boisduval mentions this fact, giving erroneously priority to *ceanothi* Behr.

Page XXXII. of the Bulletin Soc. Ent. France was issued with the first part of the Annales for that year and deals with the meetings held from January to March. Dr. N. Banks, who has kindly examined some of the current publications with a view to ascertaining the date on which Part I. of the Annales was published writes me that unfortunately no record of its reception is to be found either in the Transactions Ent. Soc. London or the Stettiner Entom. Zeitschrift. However, in the Proceedings of the meeting of the London Entomological Society, held Sept. 3rd, 1855, the receipt of a reprint entitled "Lettre adressée a M. Jacquelin du Val, etc.," is recorded; this reprint is from p. XXVI. of the same Bulletin and was read at the same meeting at which Boisduval presented his specimens. It must have been received by the Society between Aug. 6th and Sept. 3rd. It seems reasonable therefore to suppose that Part I. of the Annales for 1855 must, at the very latest, have appeared some time in August; as a matter of fact it probably was issued several months earlier.

Euryalus Bdv. will therefore clearly take priority over *ceanothi* Behr as the name for the Californian Silk-worm Moth, the name *rubra*, as used by later entomologists, having no valid standing.

CRANE-FLIES OF NEW YORK.

Cornell University has just issued Part II. of "The Crane-Flies of New York" by Charles Paul Alexander. This part, which is published as Memoir 38 of the University Agricultural Experiment Station, deals with the biology and phylogeny of the crane-flies and gives representative crane-fly life histories, external and internal morphology, and concludes with keys and descriptions. The monograph contains about 450 pages.

To persons interested in research in the field covered by the Memoir, copies will be sent as long as the supply lasts. Ask for M-38, and address requests to Office of Publication, College of Agriculture, Ithaca, New York.

Dr. C. L. Metcalf, for the past seven years Professor of Entomology in Ohio State University, has resigned to accept the position of Professor of Entomology and Head of the Department of Entomology in the University of Illinois. He should be addressed in care of the university at Urbana, Illinois, after September first.

Mailed, Oct. 31st, 1921.

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POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE HISTORY OF A HOBBY HORSE.

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART III.—SECOND CHILDHOOD—THE TREE'S INCLINE.

I suppose one reason why people do not transplant well in middle life is that they never cease to miss the common sights and sounds of their native land ; snatched away from daily contact with the environment in which they have grown and spread until they come to fill every nook and cranny of it, they suddenly find themselves wrenched from a thousand rootlets that ministered unseen to their life needs ; starved of their sap from root to stem, they lose their lusty vigour, languish along their branches, and pine away in leaf and flower and fruit. It is impossible to feel at home anywhere until you have become thoroughly familiar with your surroundings ; this power of adaptation, shared by us with all things living, is strictly limited, and if the change is too violent or the organism too far set in maturity, acclimatization becomes impossible.

Not the faintest idea had I when I came to Canada at twenty-five years of age that my comfort and happiness depended mainly on familiarity with a whole little world of natural objects, to which I had grown so used as to be quite unconscious of their presence. The web that at infinite pains and with prolonged effort I had woven for myself, at whose centre I swung cradled in content was suddenly swept away by the rough hand of circumstance ; I was flung bodily to an infinite distance, to find myself sprawling hopelessly on the ground ; instinctively I set all my spinnerets frantically to work rebuilding the orb without which life itself was impossible, and groping feverishly for fresh points of attachment.

All the years I had lived in Great Britain, I had never approached Nature by way of Science ; though roughly familiar with the broader distinctions of *family*, I knew next to nothing of *genus* and *species*, and had never studied the classification of either Flowers, Insects, or Birds ; my knowledge was purely empirical, and for the most part I was quite unconscious of the points of distinction in form and structure that must surely underlie our recognition of individual forms. I was therefore powerless to identify what I saw, unless by good luck it happened to have a next of kin among my acquaintance in Great Britain ; with every stranger I met along the roadside, I must turn (so like your stiff Englishman!) to my companions for an introduction, and then hunt him up in Burke's Peerage or some other book of celebrities ; and I found to my sorrow on enquiry that such popular guides and illustrations of the Ontario *flora* and *fauna* were unprocurable. In little old England, which you could set afloat in Lake Superior, for a century or better, authorities more numerous almost than the entire population of Canada had been publishing descriptions as accurate as those of Scotland Yard, portraits as lifelike as Madame Tussaud's, that must infallibly lead to the apprehension of every flower, fern, insect and bird in the

British Isles, no matter how securely hidden it might fancy itself from the long arm of the Naturalist.

I was as helpless as a child, and as full of curiosity, for I had just entered a new world full of novelties ; hundreds of flowers and insects that I had never seen before, flaunted their beauty in front of me at every turn ; scores of birds with strange plumage and unfamiliar cries met my gaze on every walk in the country ; and like a child, too, I wanted at first to know just their names, to have a simple label that I could attach to them, some definite word that I could hunt up in a book, and so round out my field observations.

It is not given to all to enter second childhood thus wide-eyed and mentally alert, and for the sake of others who may be similarly placed or may want in adult life to enter on the study of Natural History, I wish here to record some of my early experiences as a stranger in a strange environment to which the senses of his neighbours had grown dulled from boyhood. And let me tell you, I found it far harder to learn the secret of the sights and sounds that met me than if I had been a child. The world of childhood and boyhood was forever shut to me, and often I found myself envying the youngsters who were penetrating such mysteries day by day, without conscious effort, by companionship with their fellows and the traditions of their kind. I was herded with the grown-ups and found most of them sadly ignorant and careless of the Natural life about them.

It was when summer was already sinking into the lap of autumn, and within a fortnight of my setting foot in Canada, that I took up my quarters in Toronto preparatory to a 3-term session at the School of Pedagogy. Almost the first things that had struck me were the wonderful clarity of the air, and the lavish way of the sun in spilling whole weeks of blue unclouded summer days over the land. As we steamed up the St. Lawrence, I had noted with astonishment the sharp outlines and bright colours of the houses along the distant shore, so different from the hazy indistinctness of an English landscape. On landing at the docks I had been taken through Montreal on a sight-seeing tour ; I can't remember now what "Notre Dame" looked like either inside or out, but I know that the streets and sidewalks of the city were literally covered with grasshoppers, almost in the heart of the business section. About Toronto when you walked in the fields, every step you took squirted showers of these insects, as well as crickets and locusts, up at your face. It was as hard to steer a conversation safely through such elements as for a swimmer to breathe in a choppy sea,—you never knew when you were going to get a mouthful ; and often it was impossible to be quite sure whether your last ejaculation had been a word or an insect. After a little experience one learned to wade along in silence, glasses jammed close up to one's eyes and mouth tight shut, like a ship running through heavy seas with port holes closed and hatches battened down. Ontario had been in the grip of a drought for five or six weeks, a very exceptional thing, I was told ; but most of the twenty-five years passed in Ontario since 1894 have only gone to prove the rule of this exception.

My walks that Fall were mostly in the direction of Rosedale, and all of them alive with wonders ; chipmunks and groundhogs, severally after their kind, came chattering and frisking forward with eager curiosity to meet the tender-

foot, went scurrying in shortlegged rippling bulk across the fields or stood stock still and bolt upright, "frozen" at the mouth of their burrow, the living counterpart of a neighbouring stump; acres of goldenrod and asters rioted beside the path; goldenrod of the most beautiful curving-plumes in place of the stiff homely spikes of the British species; asters of every size and shade, from white and pale lilac to the rich violet and blue of the Michaelmas Daisy; butterflies that fairly made one's mouth water, Swallow Tails and Fritillaries (Silver Spots), Camberwell Beauties (Mourning Cloaks), Tortoiseshells and Painted Ladies, fluttered and sailed and flew, a bevy of beauty; and mingling with them strangers of unmistakably royal blood (to judge from their robes), Emperors and Viceroys worthy of a front page in Burke's Peerage; and then the birds! In place of a single Green Woodpecker—rare and local—I saw four or five kinds, all painted as gay as the Tropics, the Flicker, the Red Head, the Downy, the Hairy, and these, mind you, for all their gorgeous plumage, as common as sparrows, or poppies in a cornfield. To cap it all, my ears were filled from every side in the woods with myriads of strange sounds, tapping, creaking, chirping voices, call-notes and songs, as mysterious as Echo, and all clamoring for me to join their game of "I spy" and track them to their secret lair; the very heavens were full of sound, showers of soft twittering notes and sweet music fell about me in the open; Puck in the woods and Ariel in the sky, what a royal hide-and-seek they had with me that Fall!

As we were returning from Rosedale on one of these early trips, I called my companion's attention to the barking of a foxterrier in the distance; after locating the sound, he stared at me incredulously for a moment and then remarked scathingly: "A nice one you are in the country, and not know a crow when you hear it!" And a crow it proved to be, but how different, with its short, sharp, staccato challenge, of "cá, cá," from the English rook and its lazy drawl of "cäa, cäa!"

Two other birds I met that Fall for the first time in my life, the lovely Bluebird (a close kinsman of the English Redbreast) and the American Robin. This last I had looked eagerly forward to seeing for over a year; ever since the day when I had joined in the laugh that went round my uncle's dinner-table one Christmas at the expense of a cousin newly home from British Columbia. He had been regaling us with travellers' tales of the strange land beyond the seas, and we had all been devouring them with relish and perhaps a pinch of salt; till he came to this outrageous whopper, no more to be swallowed than Gulliver's reported linnets from Brobdingnag as big as swans: "In Canada," remarked my cousin with some pride, "our robins are as large as blackbirds." "Yes," countered my uncle drily, "and how large are your turkeys, my boy?" It was only when I became a resident of Ontario that I discovered the robins were a red-breasted thrush; and in the Spring it soon grew to be an exquisite pleasure to note the bird's song, so characteristic of the thrushes, with its tell-tale bars "sung twice over," as Aristophanes observed more than twenty-three centuries ago and Robert Browning somewhat later;—and if you had no ears to hear, behold! the dumpy fledglings, with the speckled breasts they bore, and the way they had with the garden worms, the quick little run over the lawn and the head cocked on one side to listen, thrushes every inch

of them, from the tip of the bill to the toes.

During the winter I had made the acquaintance of Dr. Brodie and he had promised to take me out with him in the Spring ; unfortunately I was too busy between April and June to steal much time for Natural History. I was able, however, to make three or four trips in the doctor's company and learn something about the environs of Toronto. About the time of the Spring flights of warblers, we had a day at Victoria Park ; and later he took me over the Don flats to a wooded hill-side beyond the C.P.R. The trip I recall most vividly was my first visit to High Park. It was in June and our way led past the Grenadier Pond, and then west and north. I was greatly struck with the beauty of the scenery, the rolling downs, with their deep ravines, the groves of oak and pine, the underbrush and the richness of the vegetation, interspersed with barren tracts of drifting sand. High Park became a favorite resort of mine and I came in later days to wander all over the district from Parkdale to Humberside and Lambton.

We had taken insect nets with us, and in a heathy space dotted here and there with oaks I captured several butterflies ; they were nearly all quite strange, and it was then, I think, that there first came home to me the hopelessness of identifying species without good illustrated popular books of entomology ; it was all plain sailing as long as the doctor was with me, but I fully realised how helpless I should be alone. On our way back in the late afternoon, we heard a bird singing in a near-by oak, and stopped to listen. I had rarely heard more delicious music, though obviously of less range and richness than a nightingale's ; it was certainly finer than the English thrush, I thought, and wilder like the Missel thrush's, the bars often repeated in true throistle fashion, and with many interludes of those wonderful soft undertones when you knew the bird's throat feathers would be gently ruffling above the breast ; the doctor thought it was a Hermit thrush ; it was certainly of the thrush family, for I caught a glimpse of it, large, brown, and with speckled breast ; I have since identified the bird from my recollection of the song, as the Brown Thrasher, and its choice of perch confirms this, almost at the top of a large oak, proclaiming itself to the world.

Without either musical ear or knowledge of musical terms, I wish to put it on record that except from the English nightingale I have rarely heard more delightful music than this bird's. It is quite a mistake to suppose that because poets have sung more wonderfully about the English skylark, the thrush and the nightingale, these bird-songs themselves must be far grander than those of Ontario ; the Brown Thrasher and the Rose-breasted Grosbeak are a match any day for their British cousins, and the Hermit Thrush is declared by such masters as John Burroughs and Schuyler Matthews to be more than the peer of the Nightingale ; it isn't the Bird that is wanting, it is the Wordsworth, the Shelley and the Keats ; given the human soul whose chords respond to the birds' ineffable sweetness, their tender melancholy, their world-old pathos and ecstasy of passion, and they too will be among the immortals.

Another fallacy the faithful observer must expose, in spite of poets' protest, is what Ruskin calls "the pathetic fallacy,"—to which we are all peculiarly prone in listening to the songs of birds ; we know, if we reason it out, that

there can be none of the rich content of human thought and the depth of human emotion behind those warblings ; yet as we listen the heart aches with infinite yearning, we are under the spell of enchantment and it sways our whole being. It is recorded somewhere how Shelley was rudely awakened from a dream of love once by the sight of his *inamorata's* healthy zest over a mutton chop ; he would have had the same revulsion of feeling in a Cambridge lane with me while listening to the Nightingale on a sunny day of June ; in the very midst of one of its divinest passages, its throat feathers stirring to the liquid melody, the bird stopped short and darted down to gobble a big grub, like the greediest fowl on wings—a *prima donna* and a glutton !

Soon after this trip to High Park, I went to spend the summer on Centre Island with some city friends, and at the close of the year was appointed to the staff of the Smith's Falls High School, on the Rideau River, some fifty miles south of Ottawa.

This was my first year in a country district and I hugely enjoyed meeting the natural conditions of an Ontario winter. Many a time as children in Scotland we had battled our way to school through blizzards of snow, had eagerly consulted the glass to see if "the black frost" was going to make the ponds bear, and one winter had twice seen with bulging eyes the mercury fall below zero. Sledges and skates had long vanished away, but again and again I found the experiences of this first real winter in Canada send my thoughts harking back over fifteen years and more to the Perthshire home.

It may have been this that made me more than usually homesick on the approach of Spring. I hungered for the sight of English hedgerows with sweet violets, primroses, hyacinths and half a hundred other familiar sights. I had forgotten for the moment all the novelties that had come in their stead, and this nostalgia lasted on all through the dreary days of March and early April, when nothing seems to be alive, and all the highways and byways stick up their effective "No Trespass" sign, daubed in inches of mud and slush. Another torture of Tantalus that aggravated my hunger later on was to be sent on some wild goose chase of eager anticipation, as when I was told of a bed of cowslips and found marsh marigolds, honeysuckle that proved to be columbine, Yellowhammers that were Flickers ; I had even a childish disappointment over the "Daddy-long-legs" when it turned out a spider instead of a crane-fly.

Our school had only three assistants, and it was practically Hobson's choice for companionship ; the only man on the staff besides myself was the teacher of Science, and we had already fallen into the daily habit of walks together long before the winter ended.

The course of work for Science then in the Junior School was almost entirely Botany, and I watched with considerable interest his preparations for identifying flowers, an art till then wholly unintelligible to me. Half in a spirit of fun I rigged myself out with a little linen-tester for a magnifying-glass, a pair of small needles sunk over head and ears (if they had them) in the pith core of a lilac twig, and a copy of Spotton's High School Botany ; in three days I had outstripped even the most eager of his pupils ; in a week the jest was deadly earnest, and in a month the zealot became a hopeless monomaniac. I still hated to pick the flowers to pieces, and the tedium of working out some of the

less attractive genera and families, like the Crucifers and the Composites, came near to damping my ardour. Still I persevered, even resisting as a rule the terrible temptation to guess at the plant's identity *a priori*, instead of working it out honestly by the key. I think my progress surprised even my foster parent the Science master, for I took to Botany as a duck takes to the water; he hadn't allowed enough for some of the main factors in the problem; I had spent years in the English lanes and knew the household names of most of the familiar flowers; Greek and Latin had become almost a mother tongue to me and a second nature, so that the botanical terms were full of meaning; and, more than all, I burned with desire to gain "the freedom of the realm"; ahead of me I could see summers full of glorious discovery in Ontario; and when I had discovered America (botanically), I was determined to go over and discover Great Britain; and never did Highlander with the gift of second sight see the vision of his own future more truly than I did that first Spring in Smith's Falls. It was a case of Archimedes and his lever over again; given Spotton (or Gray), I could move the universe—or at least stick labels all over it; if an Afrite had dropped me into the heart of some equatorial forest, I'd have welcomed the chance and, bar cannibals, crocodiles and the tsetse fly, been as happy as a clam.

That plants like animals had sex was a piece of common knowledge, but the analysis of a flower and the names and relations of its different parts were quite new to me. My first lessons were in this, and by taking a few leading types and separating their parts, identifying each of these and studying their mutual relations, I soon got the hang of the system.

The very heart and centre of every perfect flower was an elongate hollow body (the pistil) of complex nature, comprising below a vessel (the ovary) in which the unripe seeds (ovules) developed; at the upper end of the ovary was a vertical extension in the form of a slender tube or hollow stalk (style) whose widened apex (stigma) served as a receptacle for the pollen-grains, which then passed down the style-tube into the ovary; round this procreant cradle of the flower were grouped, like a body guard round their queen, a set of tiny stalks (stamens), each surmounted by a pair of little boat-shaped vessels (anthers) of pollen to quicken the ovules; in turn about these two essential parts,—the queen and her consorts (pistil and stamens), were grouped usually two sets of leaf-like protective lobes known as the floral envelope; the inner ring (corolla) of brightly colored lobes (the petals), and the outer ring (calyx) of green lobes (the sepals); if only one of these two rings occurred, whether green or brightly colored, it was called the calyx of sepals.

According to the form of the pistil and the number and arrangement of stamens, petals and sepals, all flowering plants were arranged into two great divisions: I. those whose seeds in germinating sprouted into a single leaf (Monocotyledons), and II. those whose seeds sprouted into a pair of leaves (Dicotyledons.) The first class had nearly always straight or parallel veins in the leaves, and their flower parts in 3's; it included (a) Arrowheads, (b) Grasses, (c) Sedges, (d) Arums, (e) Rushes, (f) Lilies, (g) Irids, (h) Orchids. The second class had net-veined leaves and the parts of the flowers in 5's and 4's, occasionally 2's. Of this class a small sub-division bore the seeds naked (i.e.

not enclosed in a capsule), like the pines ; but the vast bulk of them possessed ovaries or seed cases. These were arranged in three divisions (1) those with one or both of the outer rings (corolla and calyx) wanting (Apetalous) ; (2) those whose petals were not united to one another (Polypetalous) ; (3) those whose petals were united, whether altogether or only at the base (Gamopetalous).

In the first few weeks of Spring it was easy to keep pace with the procession of flowers and assimilate the principles of the new science at the same time ; but in June and July the different kinds of habitat became so numerous and so crowded that one could not visit them all often enough to exhaust their denizens. However, in the course of two years, I knew nearly all in the neighbourhood, and it was only by going to a distance that I could add to my acquaintance ; but by a happy provision of Nature, when novelties ran out, the pleasure of renewing old acquaintance out-begged the joys of fresh discovery.

(To be continued.)

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA).

BY JOHN D. TOTHILL.

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While in Washington, D.C., in March, 1921, Dr. Aldrich suggested that a revision of the nearctic species of the genus *Ernestia* would be a profitable undertaking. The rich collection in the U. S. National Museum was placed at my disposal, and I had with me some material belonging to the Entomological Branch of the Dominion Department of Agriculture and some California material belonging to Mr. E. P. VanDuzee. It was soon found that the male genitalia afforded an excellent series of characters for separating out the species, and the revision was consequently based largely upon a study of males. When the males had been sorted out into sixteen species, it was found that the females could be sorted out into fourteen species. It was not possible in all cases to assign a male and female to each species, and as the male characters are more readily seen than the female ones, it seemed better to base the descriptions of new species upon males. Descriptions of twelve new species have been drawn up and also of such of the existing species that seemed to require a more ample description than has been published. Well known and easily recognizable species have not been redescribed.

It is a great pleasure to acknowledge the cordial assistance given me by Dr. J. M. Aldrich, and also to express my sense of appreciation to Mr. Arthur Gibson, the Dominion Entomologist ; Dr. L. O. Howard, the Chief of the U. S. Bureau of Entomology ; and to Mr. A. F. Burgess of the U. S. Bureau of Entomology, for making the study in Washington possible. Mr. Charles T. Greene has been kind enough to make the drawings for this paper.

THE GENUS ERNESTIA R.D.

Erigone R.D. Myod. 65, 1830.

Mericia R.D. Myod. 64, 1830.

Platychoira Rond. Dipt. Ital. Prod. 1859.

Varichaeta Speiser, Berl. ent. Zeit. 1903.

Panzeria R.D. Myod., 69, 1830.

Okanaganian Tn. Can. Ent. 289, 1915.

Melinocera Tn. Proc. Biol. Soc. Wash. XXVIII., 22, 1915.

The genus *Ernestia* was proposed in 1830 by Robineau Desvoidy for the reception of a single species that he called *microcera*. According to Bezzi (Kat. Pal. Dipt. 1907) the species *microcera* R.D. is a synonym of *rudis* Fall. described in 1810 as a *Tachina*. As the species *rudis* Fall. does not properly belong in the genus *Tachina*, it therefore becomes the type species of the genus *Ernestia*.

The genus *Fausta* was proposed in 1830 by Robineau Desvoidy for the reception of five species. In 1863 the same author designated *nemorum* Meig. as the type species of the genus. For reasons that will appear later, it seems that in spite of the wide parafacials, this species is closely related to the generalized *Ernestias*, such as *rudis* Fall. and *radicum* Fab. In order to preserve the sense of relationship with *Ernestia* and yet to bring out the difference between the two series, it seems advisable to treat *Fausta* as a subgenus of the genus *Ernestia*.

The species described by Coquillett as *Meriania chalybea* is undoubtedly congeneric with *puparum* Fab. of Europe, a male and female of which—determined by Bezzi—I have seen. The genus was proposed for species having the sides of the face hairy and otherwise resembling *Ernestia* s. str. Hairiness of the facialia in this group is, however, of questionable generic value because *Ernestia flavicornis* Br. exhibits a marked tendency in this direction, especially in some specimens. Furthermore, the male genitalia in *chalybea* Coq. and in *puparum* Fab. also exhibit the same generalized features as do those of *E. flavicornis*. The best way to express this clear relationship seems to be to treat *Meriania* as a subgenus of the genus *Ernestia* for the inclusion of *puparum* Fab., *chalybea* Coq., *flavicornis* Br., and *nigrocornea* sp. n.

These two subgenera, *Fausta* and *Meriania*, are evidently closely related, as shown by the generalized genitalia. In the known species they can be separated by the presence of discal bristles on the second abdominal segment in *Fausta* and by their absence in *Meriania*; and by the presence of hairs on the parafacials in *Meriania* and by their absence in *Fausta*. An undetermined female *Ernestia* from Armstrong, B.C., in the National Collection at Ottawa has both hairy parafacials and discal abdominal bristles; if, when the male becomes known, this proves to belong to the *Fausta-Meriania* group, it would show that these two subgenera could be treated more naturally as a single subgenus.

The genus *Metaphyto* was proposed by Coquillett in 1897 for the reception of a single species, *genalis* Coq. This species has wide parafacials as in *Fausta* and genitalia that relate it to *Ernestia arcuata* et al. (See the discussion of this point later). The relationships will be fairly well expressed by treating *Metaphyto* as a subgenus of the genus *Ernestia*.

An examination of the type of *Okanaganian hirta* Tn. shows the fly to be *E. (Metaphyto) genalis* Coq.

Xanthophyto labis Tn. may prove to be an *Ernestia* when more is known about its habits. The yellow third segment of the antenna, the cloud over the radio medial cross vein, and the generalized condition of the male genitalia all

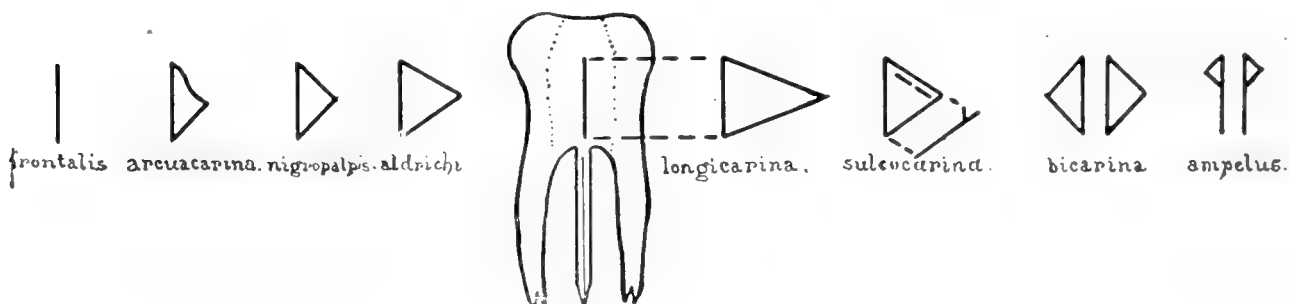
suggest a close affinity with *E. flavicornis* Br. Until the male is known, however, and until the reproduction habit is established, there is not sufficient justification for linking the genus with that of *Ernestia*. In *X. labis* the chaetotaxy of the scutellum differs from that of all the known species of *Ernestia*.

Pyraustomyia penitalis Coq. exhibits the same peculiar scutellum chaetotaxy found in *X. labis*, and is probably not congeneric with *Ernestia*.

In so far as is known, all the members of the genus *Ernestia* have the habit of depositing living maggots in the path of their host.

INTERRELATIONS OF THE NEARCTIC SPECIES

The nearctic species of the genus *Ernestia* differ from one another chiefly in the structure of the male genitalia—most of the species are in fact inseparable without reference to these organs. Arranging them in a series according to the degree of specialization of the genitalia, one can therefore gain some idea as to their immediate ancestry. The most generalized condition of the genitalia is found in *E. flavicornis* Br., *E. nigrocornea* sp. n., *E. chalybea* Coq., and *E. frontalis* sp. n., where the base of the inner forceps has developed no median keel-like projection. In *arcuata* sp. n., *johnsoni* sp. n., *nigropalpis* sp. n., and *incisa* sp. n. there is a well-developed keel-like projection. More highly specialized again are *E. aldrichi* Tn. and *E. longicarina* sp. n. in which the keel-like projection has become longer than in any other known nearctic species. In *E. platycarina* sp. n. one margin of the carina has become flattened. In *sulcocarina* sp. n. the same margin has become grooved. In *bicarina* sp. n. the groove in the carina has developed to such an extent that a splitting has oc-



cured so that there are two keel-like projections instead of one. Finally, in *E. ampelus* Walk., and in *E. fissicarina* sp. n., the two keel-like projections have become reduced into a pair of knob-like structures. From these facts the group would appear to be monophyletic. With the evolution of the keel-like projection in mind, it is possible to test the validity of the genus *Fausta* proposed for the reception of forms having the sides of the face abnormally wide. In the type species *E. nemorum* Meig., the keel-like structure is in the generalized condition found in *E. flavicornis* Br., *E. frontalis* sp. n., *E. nigrocornea* sp. n., *E. rudis* Fall. and *E. radicum* Fab. In the nearctic species *genalis* Coq., on the other hand, there is a well-developed unsplit median keel-like projection as in *E. arcuata*. It would seem, therefore, that *Fausta* is not a natural genus, as the species are less closely related to one another than to species in the genus *Ernestia*. An explanation that suggests itself is that in the evolution of the *Ernestia* group a widening of the sides of the face has taken place twice; first when the genitalia were still generalized, and secondly when a keel-like process had been developed. Such a relationship can be expressed by retaining

Fausta as a subgenus for the inclusion of the generalized *nemorum* Meig. and by retaining *Metaphyto* Coq. as a subgenus for the inclusion of *genalis* Coq.

RELATIONSHIPS OF THE NEARCTIC AND PALAEARCTIC SPECIES OF THE GENUS

ERNESTIA S. STR.

From an examination of five palaeartic species it would appear that while some of the nearctic species are very closely related to palaeartic species, yet there are perhaps no two species common to the two land masses. A more extensive study of the European material may, of course, serve to modify this statement. It may be of interest to point out the difference between the European species I have examined and their nearctic relatives.

A male specimen of *E. rudis* Fall., so determined by Bezzi, has no keel-like projection on the basal part of the inner forceps, and in this respect resembles *E. flavicornis* of Brauer and my *E. frontalis*. It differs from the former in not having a bright yellow third antennal segment and from the latter in having the width of the front at the narrowest place equal to less than the length of the second antennal segment.

A male specimen of *E. radicum*, so named by Brunetti, has a keel-like projection on the basal part of the inner forceps in such a rudimentary condition that it can only be seen by careful scrutiny. It differs from *E. flavicornis* Br. in the color of the third antennal segment; from *E. frontalis* in the notably shorter inner forceps of the male genitalia and from *E. nigrocornea* in the narrower facialia.

A male specimen of *E. connivens* Zett., so named by Bezzi, is evidently very closely related to my *nigropalpis* and *arcuata*. In *nigropalpis*, however, the tips of the outer forceps are laterally compressed so as to be bayonet-like in shape; and in *arcuata* the fifth tergum is much longer and more clearly defined.

A male specimen, named *E. consobrina* Meig. by Bezzi, has a median keel-like projection on the base of the inner forceps that is split longitudinally into two halves, very much as in the case of my *bicarina*. In the latter species, however, the splitting process has been carried considerably further; and also each prong of the fifth sternite terminates in a short spine, which is not the case in *consobrina*.

There is a male specimen from Shirmer, labelled "Berlin, Germany," that has not been identified. It runs in my key to section 10 but it can be readily separated from all the nearctic species on account of the extraordinary length of the median keel-like projection on the base of the inner forceps.

DISTRIBUTION OF THE GENUS ERNESTIA.

Our knowledge of the distribution of the genus *Ernestia* in the Southern Hemisphere is too meagre to warrant any conclusion concerning the origin and development of the group for the whole world. For the Northern Hemisphere, however, our knowledge of the distribution of the group is at least fairly complete. In his catalog of palaeartic Diptera, Kertész lists twenty-three species, while for North America we now have sixteen species; consequently, palaeartic rather than a nearctic origin is indicated, although, of course, by no means proven.

Further light is thrown upon this question by reference to the degree of specialization of the species in the respective regions. We have already

seen that the condition of a split keel-like process on the base of the inner forceps represents almost the highest achievement in the specialization of these flies. This condition is reached by *E. consobrina* Meig. in Europe and by *E. bicarina* sp. n. in America. It therefore seems certain that the split keel was achieved when a land bridge connected the two great land masses. It also follows that the group achieved its greatest development during the period of the last land bridge. Indeed, the only development of any importance that appears to have taken place since the land bridge days is the reduction of the split keel found in the two American species, *ampelus* Walk., and *fissicarina* sp. n.; and further studies of the palaearctic species may show even this slight specialization to have been an ancient rather than a modern achievement.

As there are reasons for supposing that very few, and perhaps none, of the now extant species are common to the two land masses, it seems to follow that although the nearctic and the palaearctic species have had a common origin during the land bridge period, yet a slight further development has been achieved in each of the now separated land masses during the recent period of isolation.

SYNOPSIS OF THE NEARCTIC SPECIES IN THE GENUS *ERNESTIA* R. D.

Subgenus *Meriania*.

chalybea Coq.

flavicornis Br.

nigrocornea sp. n.

Subgenus *Fausta*.

No nearctic species known.

Subgenus *Ernestia*.

frontalis sp. n.

johnsoni sp. n.

nigropalpis sp. n.

arcuata sp. n.

incisa sp. n.

aldrichi Town.

longicarina sp. n.

platycarina sp. n.

sulcocarina sp. n.

bicarina sp. n.

ampelus Walk.

fissicarina sp. n.

Subgenus *Metaphyto*.

genalis Coq.

KEY TO THE SUBGENERA OF THE GENUS *ERNESTIA*.

1. No discal macrochaetae on the second abdominal segment; parafacials hairy, at least in the females, especially on the upper part..... Subg. *Meriania*
- Discal macrochaetae present on the second abdominal segment; third antennal segment black; parafacials never hairy, even on the upper part.....2
2. Width of the parafacials not nearly equal to the length of the third anten-

- nal segment.....*Ernestia* s. str.
 Width of the parafacials equal to the length of the third antennal segment,
 i.e., parafacials unusually wide.....3
 3. A median keel-like projection at the base of the inner forceps of the male
 genitalia, i.e.; genitalia specialized.....Subg. *Metaphyto*
 No such projection, i.e., genitalia generalized.....Subg. *Fausta*

KEY TO THE NEARCTIC SPECIES IN THE SUBGENUS MERANIA.

1. Third antennal segment black.....*E. nigrocornea* sp. n.
 Third antennal segment yellow or reddish.....2
 2. Width of front in male equal to less than the length of the second antennal
 segment; parafacials very hairy in the male.....*E. chalybea* Coq.
 Width of front in male equal to the length of the second antennal segment;
 parafacials in the male hairy on only the upper part and the hairs very
 thin.....*E. (Meriania) flavicornis* Br.

KEY TO THE MALES OF THE NEARCTIC SPECIES OF THE GENUS ERNESTIA S. STR.

1. Genitalia yellow or rufous.....2
 Genitalia dark or black.....3
 2. Width of the front at narrowest place less than the length of the second
 antennal segment; inner forceps with a short keel flattened on one
 edge.....*platycarina* sp. n.
 Width of the front at narrowest point equal to or greater than the length
 of the second antennal segment; inner forceps without a keel and with
 two conspicuous projections placed side by side.....*ampelus* Walk.
 3. Width of front at narrowest point fully twice as long as the second anten-
 nal segment.....4
 Width of front at narrowest point less than twice the length of the second
 antennal segment6
 4. Inner forceps with a conspicuous keel.....*aldrichi* Tn.
 Inner forceps without a keel.....5
 5. Base of inner forceps with two conspicuous projections placed side by
 side.....*fissicarina* sp. n.
 Base of inner forceps without such projections.....*frontalis* sp. n.
 6. The fifth sternite with a deep incision on the lateral margin of each of the
 two prongs.....*incisa* sp. n.
 The fifth sternite normal.....7
 7. The inner forceps with a pair of short keels placed side by side.....
*bicarina* sp. n.
 The inner forceps with a single keel.....8
 8. The width of front as great or greater than the length of the second anten-
 nal segment.....*johnsoni* sp. n.
 The width of front less than the length of the second antennal seg-
 ment.....9
 9. Palpi black; the fifth tergum scarcely distinguishable from the first genital
 segment with which it is united.....*nigropalpis* sp. n.
 Palpi reddish, at least at tip; the fifth tergum clearly marked off, at least
 laterally by a suture from the sixth.....10
 10. Keel-like portion of the base of the inner forceps of unusual length, its dor-

sal edge not concave; the apical portions of the outer forceps laterally compressed and each terminating in a pair of hooks..*longicarina* sp. n.
 Keel-like portion not of remarkable length, its dorsal edge strongly concave; the apical portions of the outer forceps cylindrical and each terminated by a single hook.....*arcuata* sp. n.

KEY TO THE FEMALES OF THE NEARCTIC SPECIES IN THE GENUS ERNESTIA.

1. Third antennal segment yellow.....Subg. *Meriania*
 Third antennal segment black.....Subg. *Ernestia* 2
2. Fourth abdominal segment rufous.....3
 Fourth abdominal segment black.....4
3. Second antennal segment rufous.....*ampelus* Walk.
 Second antennal segment black.....*platycarina* sp. n.
4. Second antennal segment yellow.....5
 Second antennal segment black.....8
5. Fifth sternite without a longitudinal groove or depression; tarsal segments of front legs cylindrical; bend of fourth vein with a well-marked appendage.....sp. *a*
 Fifth sternite with a longitudinal groove or depression; tarsal segments of front pairs of legs flattened dorsoventrally; bend of fourth vein with a very indefinite or with no appendage.....6
6. Fifth sternite with a deep longitudinal depression.....7
 Fifth sternite with a very shallow longitudinal depression.....sp. *c*.
7. The depression in the fifth sternite extending through the posterior margin, i.e.; the posterior margin concave; a short but distinct carina running the full length of the depression.....sp. *b*.
 The depression in the fifth sternite not extending through the posterior margin, i.e.; the posterior margin straight; no carina in the depression.....sp. *d*.
8. Front at the vertex as wide as either eye; the second, third and fourth but not the fifth abdominal sternites each with a group of strong, blunt, downwardly directed macrochaetae seen best in profile.....9
9. Palpi coal black.....*nigropalpis* sp. n.
 Palpi yellow, at least at tip.....10
10. The fifth abdominal sternite with two parallel longitudinal grooves separated by a shallow carina.....*bicarina* sp. n.
 The fifth abdominal sternite with only a single longitudinal groove or depression.....11
11. The fifth sternite longer than the fourth.....*sulcocarina* sp. n.
 The fifth sternite shorter than the fourth.....probably *johnsoni* sp. n.

(To be continued)

NEW SPECIES OF CRANE-FLIES FROM NORTH QUEENSLAND
 (TIPULIDAE, DIPTERA).

BY CHARLES P. ALEXANDER,
 Urbana, Ill.

The undescribed species of crane-flies that are characterized herewith were kindly sent to me by Dr. James F. Illingworth. Most of the material was

collected along the Babinda Creek, North Queensland. The difficulties in the way of collecting these insects in Queensland are well shown by the following paragraph from one of Dr. Illingworth's letters:

"Sweeping along streams is almost out of the question here in the tropics, where every bush is provided with recurved hooks to hold one up. I have torn a number of nets full of holes trying to do it and seldom make a catch. Most of the specimens I found either singly on the vegetation, in the scrub, or in caverns under the large rocks along the streams."

A few additional specimens were secured by Mr. Alan P. Dodd. I would express my indebtedness to Dr. Illingworth and Mr. Dodd for this interesting material. The types of the new species will be preserved in the writer's collection.

Genus *Dicranomyia*, Stephens.

Subgenus *Thrypticomyia*, Skuse.

The type of the subgenus is *D. (T.) aureipennis* (Skuse) (Australia). Other species belonging to this group are *D. arcuata* (Alexander) (Japan), *longivena* (Edwards) (India), *seychellensis* (Edwards) (Seychelles Islands) and probably *saltens* (Doleschall) (Oriental Region). Two additional undescribed species were included in the present material.

***Dicranomyia (Thrypticomyia) doddi*, sp. n.**

General coloration dark brown; thoracic pleura obscure brownish yellow; tarsi largely white; wings with a distinct brown suffusion that is uniformly distributed over the wing surface; stigma large; supernumerary crossvein in cell Sc_1 only a short distance before r .

Male.—Length 6 mm.; wing 5.8 mm.

Female.—Length 5.5 mm.; wing 6 mm.

Rostrum obscure yellow; palpi dark brown. Antennae dark brown. Head greyish brown.

Mesonotum dark brown. Pleura obscure brownish yellow. Halteres long and slender, dark brown. Legs with the coxae and trochanters dark brown; femora dark brown, slightly paler basally; tibiae and about the basal one-half or slightly more of the metatarsi dark brown; remainder of the tarsi white or faintly reddish white. Wings with a uniform brownish suffusion; stigma large, elongate-oval, dark brown; veins dark brown. Venation: Sc ending opposite the origin of Rs ; Sc_2 pale, removed from the tip of Sc_1 , the latter being about equal to the deflection of R_{+1} ; supernumerary crossvein in cell Sc a little more than the length of r before this latter crossvein; extreme tip of R_1 atrophied;; inner end of cell 1st M_2 slightly arcuated; cell 1st M_2 about equal to vein M_3 beyond it; basal deflection of Cu_1 near midlength of cell 1st M_2 .

Abdomen dark brown.

Habitat.—North Queensland.

Holotype, ♂, Gordonvale, June, 1920 (A. P. Dodd).

Allotopotype, ♀.

Paratopotype, ♂.

This crane-fly is dedicated to its collector, Mr. Alan P. Dodd. Its closest relative is apparently *D. seychellensis* (Edwards) which differs mainly in the coloration of the wings.

Dicranomyia (Thrypticomys) fumidapicalis, sp. n.

General coloration dark brown; thoracic pleura yellow; legs dark brown, the tarsi largely white; wings hyaline basally, with about the apical fifth strongly infuscated.

Male.—Length 6—6.5 mm.; wing 6.7 mm.

Female.—Length about 5.5 mm.

Described from alcoholic specimens.

Rostrum and base of palpus obscure brownish yellow; terminal palpal segments dark brown. Antennae dark brown, the flagellar segments with a short basal pedicel and with long, unilaterally arranged verticils as in the males of this group. Head dark.

Mesonotum dark brown, the median area of the scutum and the postnotum paler. Pleura obscure yellow, the mesosternum infuscated. Halteres elongate, brown. Legs with the coxae and trochanters yellowish; only the fore legs remain attached to the body; femora, tibiae and about the basal third of metatarsi dark brown; remainder of the tarsi except the terminal segment white; fore metatarsi with a small tubercle near the base. Wings hyaline with about the apical fifth strongly infuscated, this including almost all the wing beyond the level of the cord; stigma oval, still darker brown; veins dark brown. Venation: Sc_1 before the origin of R_s , Ss_2 ending just beyond the origin of R_s , Sc_1 alone being a little longer than the basal deflection of Cu_1 ; R_s long, arcuated at origin; r near tip of R_1 ; cell 1st M_2 long and narrow, longer than vein M_3 beyond it; basal deflection of Cu_1 beyond midlength of cell 1st M_2 .

Abdomen of male long and slender, dark brown; sternites a little paler.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Allotopotype, ♀.

Paratopotypes, 2 ♂'s.

The apically darkened wings are very conspicuous.

Subgenus Idioglochina, subgen. n.

Flagellar segments with the inner face strongly produced into flattened disks, giving a subserrate appearance to the antennae, the periphery of each disk with a series of about six spinous bristles. Wings with costa and radius greatly incrassated; r long, arcuated; cell R_1 very large, due to the strong bending of R_{2+3} toward R_{4+5} near its origin.

Type of the subgenus.—*Rhipidia tusitala* Alexander (Samoa).

Dicranomyia de beauforti de Meijere (Papuan subregion) is also a member of this subgenus.

Subgenus Euglochina, subgen. n.

Wings very long and narrow, cuneiform, entirely without an anal angle; R_s very short, about equal to the basal deflection of R_{4+5} , originating far out toward the wing-tip, the cord lying beyond five-sixths of the wing-length; cells beyond the cord unusually short and crowded; vein 2nd A running parallel to Cu_1 at the margin separate or fused with the tip of Cu_2 .

Type of the subgenus.—*Dicranomyia cuneiformis* de Meijere. (India to Java).

Dicranomyia connectans Alexander (Tropical Africa) is also a

member of this subgenus. Edwards (Ann. Mag. Nat. Hist., ser. 8, vol. 8, pp. 58, 59; 1911) has determined the *Limnobia saltens* of Doleschall as falling in this group of species. Almost coincidentally, De Meijere (Tijdsch. v. Ent., vol. 54, p. 22; 1911) determined *saltens* as being a typical member of *Thrypticomyia* Skuse. The habitus of the species of *Euglochina* is very distinct from that of *Thrypticomyia*.

Genus *Libnotes*, Westwood.

Subgenus *Pseudoglochina*, subgen. n.

Tarsal claws simple, the basal enlargements provided with two acute bristles. Wings long and narrow, cuneiform, entirely without an anal angle; Rs short, straight; no supernumerary crossvein in cell Sc_1 ; cell 1st M_2 open by the atrophy of M_3 .

Type of the subgenus.—*Libnotes pulchripes* Alexander.

Dicranomyia kobusi de Meijere and *D. bicinctipes* Brunetti of the Oriental region are likewise members of this group. In the opinion of the writer, the group is closer to *Libnotes* than to *Dicranomyia* but this whole series of genera and subgenera are very closely allied.

Genus *Geranomyia*, Haliday.

***Geranomyia (Geranomyia) sagittifer*, sp. n.**

Rostrum and antennae black; vertex silvery grey; general coloration of the thorax shining orange, the mesonotal praescutum with a median arrow-shaped black mark; legs pale yellowish brown; wings pale grey with five rather small brown costal markings, vein Sc long.

Female.—Length (excluding rostrum) 6.5 mm.; wing 6 mm.; rostrum alone 2.9 mm.

Rostrum and palpi dark brownish black. Antennae black. Head above silvery grey.

Mesonotum shiny orange, the praescutum with a single arrow-shaped median black mark, the basal end behind, a short distance before the suture, the narrow end terminating slightly anterior to the level of the pseudosutural foveae. Thoracic pleura dull ochreous. Halteres orange, the knobs a little infuscated. Legs with the coxae and trochanters orange; femora brownish yellow; tibiae and tarsi light brown. Wings pale grey, the costal and subcostal cells a little more yellowish; five comparatively small brown markings in the costal region, arranged as follows: at the supernumerary crossvein in cell Sc ; at origin of Rs; at tip of Sc_1 ; at tip of R_1 and r , and at the end of the vein R_{2+3} ; cord and outer end of cell 1st M_2 very narrowly and indistinctly seamed with grey; veins brown. Venation: Sc long, Sc_1 extending to just beyond the end of Rs, Sc_2 at the tip of Sc_1 ; Rs long, angulated at origin, thence straight; cell 1st M_1 pentagonally rectangular, widened distally, about as long as vein M_{1+2} beyond it; basal deflection of Cu just beyond the fork of M.

Abdomen dull orange-yellow.

Habitat.—North Queensland.

Holotype, ♀, Gordonvale, June, 1920 (A. P. Dodd).

Paratypes, 3 ♂'s, Babinda, October, 1920 (J. F. Illingsworth).

***Geranomyia (Geranomyia) nigronitida*, sp. n.**

Head dark; mesonotum shiny black, the pleura yellowish; wings nearly

hyaline; stigma small, brown; Sc long, basal deflection of Cu_1 before midlength of cell 1st M_2 ; abdominal tergites dark brown, sternites light yellow.

Male.—Length (excluding rostrum) 6—6.4 mm.; wing 5.8—6 mm.; rostrum alone about 3 mm.

Female.—Length (excluding rostrum) 7.5—7.8 mm.; wing 6.5 mm.; rostrum alone about 3.5 mm.

Described from alcoholic specimens.

Rostrum elongate, dark brown; palpi dark brown. Antennae dark brownish black. Head dark, grayish pruinose.

Pronotum dark brown. Mesonotum shiny black, the humeral regions of the praescutum paler; in dried specimens the lateral margins of the praescutum may be slightly pruinose. Pleura obscure yellow. Halteres pale yellowish white. Legs with the coxae and trochanters yellow; remainder of the legs broken. Wings nearly hyaline; stigma small, brown; veins dark brown. Venation: a supernumerary crossvein in cell Sc; Sc long, Sc_1 extending to just before the end of Rs, Sc_2 a short distance from the tip of Sc_1 , the latter about equal to m; Rs comparatively short, straight, about twice the deflection of R_{4+5} ; inner end of cell 1st M_2 slightly arcuated; outer deflection of M_3 a little longer than m; basal deflection of Cu_1 before midlength of cell 1st M_2 , much longer than Cu_2 alone.

Abdominal tergites dark brown, especially in the female; sternites light yellow.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth):

Allotopotype, ♀.

Paratopotypes, 4 ♂ ♀.

Genus *Molophilus*, Curtis.

Molophilus unispinosus, sp. n.

General coloration sulphur-yellow; vertex with a brown spot; mesonotum light chestnut; male hypopygium with three pleural appendages on either side, the longest a cylindrical curved arm with the apex enlarged and provided with a powerful blackened spine, surrounded by numerous yellow hairs.

Male.—Length about 3.5 mm.; wing about 3.7 mm.

Described from an alcoholic specimen.

Rostrum and palpi brown. Antennal scape light sulphur-yellow, the flagellum broken. Head sulphur-yellow above with a conspicuous circular dark brown spot on the vertex; genae slightly infuscated.

Mesonotum with the praescutum light chestnut, the lateral margins dark brown; scutal lobes similar, the posterior lateral angles slightly produced laterad, light yellow; scutellum chestnut yellow; postnotum obscure yellow. Pleura brownish yellow, the dorso-pleural region light sulphur-yellow. Halteres pale, the knobs light sulphur-yellow. Legs with the coxae and trochanters pale brownish yellow; remainder of the legs broken. Wings greyish yellow, the veins yellowish.

Abdomen brownish yellow, the lateral margins of the tergites paler. Male hypopygium with three pleural appendages on either side, the longest a cylindrical curved arm that is expanded into a collar at the end, armed with a single

powerful chitinized spine, surrounded by numerous golden-yellow hairs.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

***Molophilus longioricornis*, sp. n.**

General coloration dark brown; antennae of the male elongated; pleural appendages of the male hypopygium a chitinized horn with a long, slender spine on the proximal face beyond midlength.

Male.—Length about 3.2 mm.; wing, about 3.6 mm.

Described from an alcoholic specimen.

Rostrum and palpi pale brown. Antennae dark brown; the flagellar segments are broken beyond the base but the antennae are very long, probably only a little shorter than the body. Head dark.

Thorax dark brown, only the pleural membranes paler. Halteres pale, the knobs a little darker. Legs with the coxae pale brownish yellow; trochanters yellow; remainder of the legs broken. Wings with a strong grayish suffusion; veins dark brown.

Abdomen dark brown. Male hypopygium with each pleural appendage appearing as a cylindrical chitinized horn, the bent apex suddenly narrowed into a chitinized spine that is directed proximad; beyond midlength of the appendage on the proximal face is a long, slender, slightly bent spine; the outer face of the appendage is provided with several small appressed spines.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Genus ***Limnophila***, Macquart.

***Limnophila illingworthi*, sp. n.**

Antennae dark brown, the first flagellar segment light yellow; mesonotal praescutum and pleura brownish yellow, narrowly striped longitudinally with brown; legs dark brown, femora with a narrow yellowish subterminal ring; tibiae with a narrow yellowish ring just beyond the base; wing light gray, the costal margin strongly yellowish; a series of dark brown costal spots; all cells of the wing dotted with gray; costal fringe conspicuous.

Male.—Length about 8 mm.; wing about 8.5 mm.

Described from an alcoholic specimen.

Rostrum brown; palpi dark brown. Antennae dark brown, the first flagellar segment conspicuously light yellow; antennae short, the first scapal segment elongate. Head brown, paler between the eyes.

Mesonotal praescutum brownish yellow, indistinctly striped longitudinally with brown, there being a more conspicuous median stripe that becomes obliterated before the suture and two sub-lateral stripes on either side; lateral margins of the praescutum darker brown; scutum obscure brownish yellow, each lobe encircled by brown, this circle darker anteriorly and laterally; scutellum pale brownish yellow with a narrow brown median line; postnotum pale brownish yellow with the median line darker brown and with two transverse bars, one near midlength, the other at the posterior margin. Pleura yellow, striped longitudinally with pale brown, there being two or three more or less complete brown stripes that are a little narrower than the pale stripes between. Halteres yellow, the knobs slightly darker. Legs with the coxae yellow, traversed by narrow brown lines, there being two such lines on the fore and middle coxae;

trochanters yellow ; femora dark brown, with a narrow light yellow ring before the broad (2 mm.) tips ; tibiae dark brown with a narrow light ring immediately beyond the base, this a little broader than the pale femoral ring ; tarsi pale brown. Wings light gray, the costal margin strongly yellow ; wings heavily spotted with dark brown and gray ; a series of dark brown spots along the costa, there being about ten before the larger one at the tip of Sc ; three additional large spots situated at the ends of veins R_1 , R_2 , and R_3 ; a large pale brown area at the origin of Rs and as seams along the cord and outer end of cell 1st M_2 ; all cells of the wings with rather abundant gray dots, a little larger and heavier at the ends of the longitudinal veins ; veins brown, costa, subcosta and radius more yellowish. Venation: Sc long, Sc_1 extending some distance beyond the fork of R_{2+3} , Sc_2 nearly three times as long as Sc_1 alone ; indistinct supernumerary crossveins in the last three brown spots in the costal cell ; Rs long, almost square at origin ; R_{2+3} short, shorter than the basal deflection of Cu_1 ; r at the tip of R_1 and beyond midlength of R_2 ; inner ends of cells R_3 , R_5 and 1st M_2 in oblique alignment ; cell 1st M_2 long and narrow, the outer end widened ; petiole of cell M short, about equal to the basal deflection of Cu_1 , the latter inserted just before midlength of cell 1st M_2 ; costal fringe conspicuous.

Abdominal tergites brown, darker brown laterally ; sternites a little paler, especially on the caudal half of the segment.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Paratopotype, ♂, October, 1920, (J. F. Illingworth).

This handsome crane-fly is dedicated to its collector, my friend, Dr. James F. Illingworth. It is possible that it is more correctly referable to *Epiphragma* but the supernumerary crossveins in the costal cell are very faint and three in number.

ANNOTATED CHECK LIST OF THE MACROLEPIDOPTERA OF ALBERTA—ADDITIONS, 1920

BY KENNETH BOWMAN,
Edmonton, Alberta.

I record below the additions to my "Check List of the Macrolepidoptera of Alberta, published by the Alberta Natural History Society (Red Deer, 1919), which were made during the season of 1920.

The numbers before the names are those of Messrs. Barnes and McDunnough's "Check List of the Lepidoptera of Boreal America, 1917." The numbers after the names indicate the month in which the insects were taken. The capital letters are abbreviations of localities, as follows: B, Banff ; Bm, Blairmore ; C, Calgary ; Cd, Cadomin ; E, Edmonton ; L, Laggan ; N, Nordegg ; P, Pocohontas.

The insects were identified by Messrs. Barnes & Lindsay, Mr. L. W. Swett and Dr. J. McDunnough, as shown by the initials in brackets following each insect. I wish to express my great indebtedness to them for their kindness in identifying these insects.

57	<i>Eurymus hecla pallida</i> Skin. & Men.	6 N.	(B & L)
205	<i>Euphydryas colon</i> Edw.	6 Bm.	(B & L)
957	<i>Isia isabella</i> A. & S.	6 C.	(B & L)
987	<i>Apantesis blakei superba</i> Stretch.	7 C.	(B & L)
1310	<i>Euxoa atropulveria</i> Sm.	9 Bm.	(B & L)
1567	<i>Rhynchagrotis morrisonistigma</i> Grt.	7 N.	(B & L)
2362	<i>Eremobia alticola</i> Sm.	8 Cd.	(B & L)
3576	<i>Lomanaltes eductalis</i> Wlk.	7 E.	(B & L)
3945	<i>Carsia paludata</i> Thun.	8 E.	(B & L)
N.S.	<i>Lobophora simsata</i> Swett	6 E. Wabaska River	(L.W.S.)
3977	<i>Lygris diversilineata</i> Hbn.	8 C.	(B & L)
3978	<i>Lygris propulsata</i> Wlk.	7.8 E. C. Cd.	(J.McD.)
N.S.	<i>Hydriomena mcdunnoughi</i> Swett	5 N. Cd.	(L.W.S.)
N.S.	<i>Xanthorhoe dodata</i> Swett.	6.8 L. P.	(L.W.S.)
N.S.	<i>Xanthorhoe reclusata</i> Swett	7 L.	(L.W.S.)
N.S.	<i>Xanthorhoe incursata lagganata</i> Swett	7 L. N.	(L.W.S.)
4156	<i>Eupithecia palpata</i> Pack.	6 E.	(L.W.S.)
4374	<i>Phasiane hebetata</i> Hlst. (<i>demaculata</i> B&McD)	6.7 E. N. P. C. Bm.	(L.W.S.)
4401	<i>Itame occiduaria</i> Pack.	7 C.	(B & L)
4424	<i>Itame decorata</i> Hlst.	7.8 C.	(B & L)
4644	<i>Sicya macularia agyllaria</i> Wlk.	8 N. Cd. B.	(J.McD.)
4726	<i>Metanema quercivoraria</i> Gn.	7 N.	(B & L)
4748	<i>Pero occidentalis</i> Hlst.	6 P N.	(B & L)
5097	<i>Phlyctaenia indistinctalis</i> Warr.	7 N.	(B & L)
5102	<i>Phlyctaenia tertialis</i> Gn.	7 E. N.	(B & L)
5253	<i>Pyralis farinalis</i> Linn.	8 E.	
6751	<i>Paranthrene polistiformis</i> Harris.	8 C.	(J.McD.)

A NEW SPECIES OF OAK GALL AND ITS MAKER.

BY B. W. WELLS AND Z. P. METCALF,

North Carolina State College and Experiment Station.

The gall described below was discovered on *Quercus marylandica* Muench., near Raleigh, North Carolina, by the senior author who was impressed by its unique characters. The specimens were brought into the laboratory and the adults reared. These adults may not belong to the genus *Andricus* but awaiting a thorough revision of the Cynipid genera they may be placed there provisionally.

The gall is very different from any other North American cynipid cecidium in the possession of the curious peltate bract-like appendages, which are borne on and constitute a part of the gall proper; in the usual situation with bracted galls the bracts are borne beneath the larval cell or cells, representing aborted leaves. The adult insects emerged about June 1st.

Andricus peltatus, n. sp.

Female.—Black, with legs and antennae testaceous yellow. Head: black, mouth parts testaceous yellow, surface uniformly but finely punctate and sparsely covered with rather long whitish pubescence; cheeks rather narrow, but more than one-fourth of the length of the long diameter of the eye. Antennae four-

teen-segmented; first and second segments enlarged, third segment one-half again as long as the fourth; segments five to thirteen nearly equal in size, segment fourteen conically attenuated, all the segments with rather heavy yellowish pubescence; segments one and two yellow testaceous, the others blackish. Thorax: black; pronotum rather coarsely punctulate with rather uniform yellowish white pubescence; mesonotum smooth, polished, parapsidal grooves deep, rather close together at the scutellum widely divergent anteriorly; scutellum coarsely and irregular rugulose, very sparsely pubescent. Legs: yellowish testaceous rather uniformly covered with paler pubescence; basal, tarsal segment shorter than 2 to 5; wings transparent, veins brownish, areolet small. Abdomen: highly polished, second segment about as long as the rest of the abdominal segments united, second segment with a few sparse hairs laterally. Length average 2.4 mm.

Holotype. Female, bred from galls on *Quercus marylandica* Muench., Raleigh, North Carolina deposited in the United States National Museum.

Paratypes. Three females and one gall in the collection of the United States National Museum, bred from similar galls.

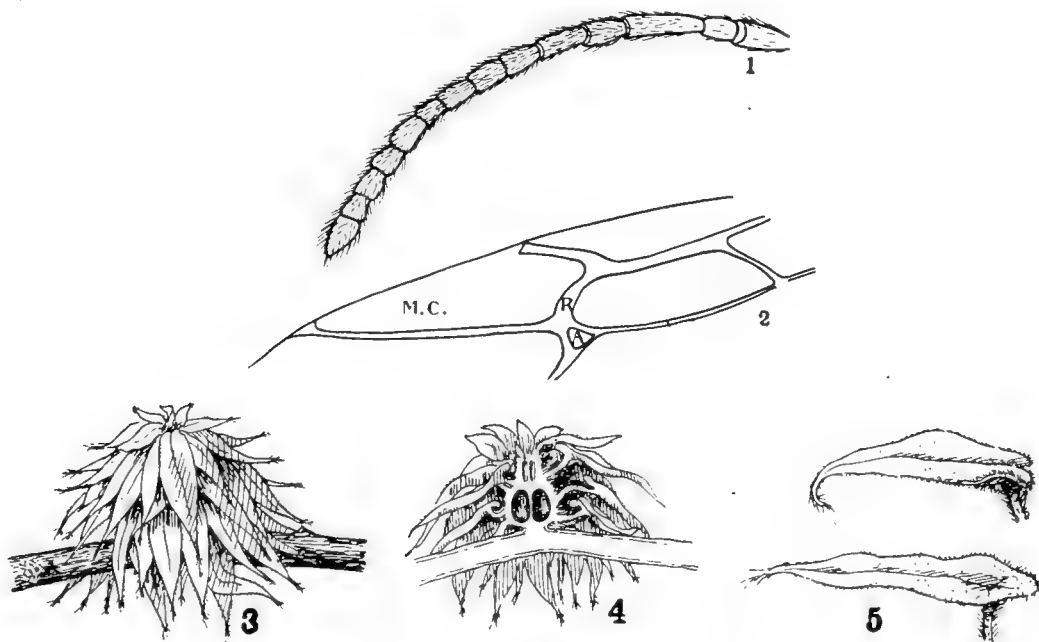


Fig. 2. 1. *Andricus peltatus*, Antenna. 2. *Andricus peltatus*, portion of wing showing radial vein (R) marginal cell (M. C.) and areolet (A). 3. Dithalamous gall (x 1). 4. Median vertical section of preceding (x 1). 5. Two bract-like appendages from gall showing peltate character (x 2).

***Andricus peltatus* Wells and Metcalf, *Cecidium* nov.**

On *Quercus marylandica* Muench., sessile on stem at nodes (originates from apical meristem of lateral bud) on branch portions from 1-5 years old; prosoplasma, concentric type with up-walled superstructure; flask-shaped, the neck bearing numerous, sparsely hairy bract-like appendages which are reflexed and overlap shingle fashion. Appendages greenish with red-tinged hairy tips, peltate, lanceolate, stalk short. When young very thickly covered with acicular trichomes some of which are of the compound stellate type; 8-14 mm. high, 14-22 mm. wide at base including appendages; 1 or sometimes 2 larval cells in proximal half (Fig. 4), distal false chambers corresponding, walls thick, thin sclerotic layer differentiated around nutritive layer lining the chamber; rare, Raleigh, North Carolina. Types in collection of B. W. Wells. The above description is based on six mature and four immature specimens.

THE NORTH AMERICAN SPECIES OF THE ANTHOMYIID GENUS
HEBECNEMA SCHNABL (DIPTERA).

BY J. R. MALLOCH,
 Urbana, Ill.

This genus differs from *Helina* R.-D., to which it is most closely allied, in having the prealar bristle absent, arista invariably plumose, fifth abdominal sternite in male with a deep U-shaped posterior excision, and the female genitalia without a pair of long slender apical processes.

KEY TO SPECIES.

1. Species entirely fulvous yellow.....*fulva* Bigot
 Species with thorax and abdomen entirely black 2
2. All femora and tibiae reddish yellow.....*pallipes* Malloch
 Mid and hind femora and all tibiae reddish yellow *nigricolor* Fallen
 All femora and usually tibiae also black 3
3. Abdomen without a dorsal central black vitta, sometimes with one or two
 pairs of very indistinct blackish spots *fumosa* Meigen
 Abdomen with a very distinct dorsocentral black vitta 4
4. Halteres with black knobs; abdomen in female entirely glossy black with-
 out pruinescence *vespertina* Fallen
 Halteres with yellow knobs; abdomen in female with distinct gray
 pruinescence 5
5. Male abdomen broadly ovate, with pearlaceous gray pruinescence, and an
 almost linear black dorsocentral vitta; mid femur with a few long fine
 bristles at base on posteroventral surface; head hardly flattened above;
 eyes hairy *umbratica* Meigen
 Male abdomen narrowly ovate, with brownish gray pruinescence, and a
 broad black dorsocentral vitta which tapers posteriorly; mid femur
 without distinct bristles basally on posteroventral surface; head of male
 distinctly flattened above; eyes bare *affinis*, sp. n.

I have included *fumosa* and *nigricolor* though so far they have not been recorded from this country. It is, however, not improbable that they will ultimately be found to occur either in New England or the northwest.

***Hebecnema affinis*, sp. n.**

Male.—Black, almost glossy. Thorax and abdomen with brownish gray pruinescence, the former very indistinctly vittate, the latter with a broad, black, dorsocentral vitta which tapers posteriorly. Legs black, the tibiae paler. Wings infuscated, more conspicuously so basally and anteriorly. Calyptrae whitish yellow. Halteres yellow.

Head rather conspicuously flattened above; eyes bare, separated at narrowest part of frons by a distance equal to width across anterior ocellus; each orbit with three or four bristles and some weak hairs anteriorly; parafacials almost invisible from the side; third antennal segment over twice as long as second; longest hairs on arista longer than width of third antennal segment. Thorax normal. Abdomen narrowly ovate; basal sternite in type with a few hairs, in other specimens bare; fifth sternite normal. Legs as in *vespertina*, except that the mid femora lack distinct bristles basally, and there are two anteroventral bristles on hind tibia.

Female.—Very similar to the female of *umbratica*, but the eyes are bare

and the abdomen more distinctly speckled.

Length, 5 mm.

Type, male, Rutland, Vt., August 1-15, 1916.

Allotype, Auburndale, Mass., June 22.

Paratypes, one male, Mt. Greylock, Mass., June 15, 1906; one female, Bar Harbor, Me., July 30, 1919.

Type in collection of Boston Society of Natural History.

I have no doubt whatever that this species occurs in Europe, where it is confused with *vespertina*, as Stein in one of his recent papers on European Anthomyiidae states that *vespertina* varies in the colour of the halteres, having them sometimes black and sometimes yellow, and in the number of bristles on the anteroventral surface of the hind tibia. I have found only one male of *vespertina* which had two anteroventral hind tibial bristles and that was on one tibia only. The colour of the halteres in both sexes of *vespertina* is black while in the new species they are yellow in both sexes.

BOOK REVIEW.

CONTRIBUTIONS TO THE NATURAL HISTORY OF THE LEPIDOPTERA OF NORTH AMERICA, VOL. IV., No. 4.

—The Pterophoridae of North America—by Wm. Barnes, M.D., and A. W. Lindsay, Ph.D.

The final number of Volume IV. of the well-known "Contributions" contains a noteworthy monographic revision of the North American 'plume-moths'. This interesting family has been much neglected by American entomologists during the past twenty years; in fact since the publication of the Fernald monograph in 1898 only a few sporadic descriptions of new species have appeared and with each year the difficulties connected with the correct determination of material in this group have become greater and greater. The present paper should obviate all this for besides 170 pages of text there are included 7 plates containing most excellent enlarged photographic reproductions of the primaries (and in some cases of the secondaries) of all the North American species, and in addition 7 plates dealing with structural details (wing venation and male genitalia).

Great care has been taken to establish the correct synonymy of each species. A large proportion of the existing type material has been personally examined and in cases where this was not possible, careful comparisons have been made by well-known specialists with material sent from the Barnes Collection. A number of changes in specific synonymy—some of them quite startling—have resulted, but these appear to be thoroughly well authenticated and must be accepted.

The greatest changes, however, are to be found in the generic nomenclature. Following what we believe to be the only course, if stability of nomenclature is ever to be attained, the authors have adhered strictly to the International Rules of Nomenclature and the opinions rendered by the International Commission on Nomenclature. According to these rules a genotype is not fixed until one of the originally included species in the genus in question has been definitely cited—either at the time the genus was created or at a later date—as

the type, all so-called 'restrictions' previous to such a time being invalid (vide Opinion 46). This latter clause has been the subject of much adverse criticism and is even now not observed by numerous Lepidopterists ; for a very able discussion of this point we would refer the reader to a recent paper by Dr. J. C. Bradley in the Transactions of the Entomological Society of London for 1919, page 51.

As a result of a strict application of the above rules for the first time to the *Pterophoridae* we find *Oxyptilus* Zell. superceded by *Pterophorus* Geoff. (type, *didactyla* Linn.) and in place of *Pterophorus*, as generally used, following Walsingham, Fernald and Meyrick, we have the term *Oidacmatophorus* Wllgn. *Platyptilia* Hbn. is used in its old established sense but *Alucita* Linn. is correctly referred to *hexadactyla* Linn., supplanting *Orneodes* Latr. The four species included under it in the Barnes and McDunnough Check List are distributed in the genera *Aciptilia* Hbn., *Pselnophorus* Wlshm. and *Adaina* Tutt., to which latter genus are also referred several species formerly included in *Pterophorus*.

The only adverse criticism of the above changes that could possibly be made is that Lamarck's *Système des Animaux sans Vertèbres* (1801) has not been accepted by the authors as fixing genotypes. The point is still a mooted one and has been touched upon by Dr. Bradley in the above mentioned paper. It is a great pity that the Secretary of the International Committee, Dr. C. W. Stiles of Washington, cannot be prevailed upon to secure an early vote on this subject, as until this matter and the one concerning the validity of Hubner's 'Tentamen' are definitely settled, no stability in the generic conceptions of the Lepidoptera is possible. In the present instance, if Lamarck had been recognized as fixing genotypes, it would have been permissible to employ both *Oxyptilus* Zell. and *Pterophorus* Linn. in the generally accepted way.

The monograph deals with 117 species of which 31 are new to science, the greater proportion of these new species being from the southwestern states and referable to the genus *Oidacmatophorus*. Keys to the genera and to the species are included and a full bibliography is given. The authors are to be highly complimented on the thoroughness of the work and it is to be hoped that through its means a fresh impetus will be given to the study of these interesting forms, the biology of which in so many cases is still completely unknown.—J. McD.

CORRECTIONS.

Page 152.—Table of Species, couplet I, second section, change to read "Disc of Thoracal squamae not pilose."

Page 153.—Couplet 9, second section, change to read, "Face without median black stripes."

Page 152.—*Syrphus ribesii*, sixth line, change "of" to "or" and read "tip, or apical sixth."

C. H. CURRAN.

Mailed Dec. 8th, 1921.

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No. 10

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE HISTORY OF A HOBBY HORSE.

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART III. SECOND CHILDHOOD—THE TREE'S INCLINE.

(Continued from Page 199.)

In spite of considerable study in the Science of Botany, I remained an incorrigible amateur, loving the wild flowers for their beauty, and to a great extent ignoring unsightly or inconspicuous weeds. But wherever a genus or a family of plants had any attractive species among them, it kindled one's eagerness to run to earth as many members of the family as possible.

The very first flower of the season opened up half a hundred avenues rich with surprising discoveries. This was the charming little *Hepatica*, pride and prime of Ontario's spring—the true Canadian primrose. The flower in itself is beautiful, of a delicate mauve, sometimes almost pure white, sometimes as pure pink or blue, and ranging through all the shades of purple or lilac between these extremes; it is true that during its short blossoming season, the plant can show only last year's leaves, darkened in the weather; but the little communities of blossom are so closely clustered, and their stems so dainty with soft silk, that the absence of foliage is hardly noticed, and before the bloom falls the new young leaves have already pushed up their 3-lobed fans all clothed with silver down; sometimes the blossoms are fragrant; they are always beautiful; like the May Flower or Trailing Arbutus of the Atlantic Provinces, well worthy to be a national emblem; it is common everywhere in the Dominion from the Atlantic to the Pacific, and—surest test of all—a prime favorite with the children. With me it was a clear case of love at first sight; but then I was always just as eager as any child to race to the woods after school and make friends with the Spring flowers.

About half a mile from the town, just east of the Brockville road, was a steep wooded ridge with a southern slope, and beyond it a spacious hardwood bush. It was on my first trip to this place that I received my initiation at the hands of the Science teacher; and evidently the news of this spread, for the pupils greeted me next day with grins broad or shy according to their nature. It was only a small piece of Indian turnip that I was given to chew, and at first—such is the diabolical cunning of the fiend that dwells in the corm—the flavor was soft and cool like a parsnip; I had, in fact, already spat the gobbet out before the burning began; but once the poisoning (for it is nothing less) first showed its symptoms, it grew at deadly pace to an intolerable burning; even next day there were still countless little crimson specks on my tongue. I cannot describe the sensations better than by saying that it brought back vividly to my mind the red horror of a far-off day in the nursery when I purloined from a cupboard half a small salt-spoonful of Cayenne pepper and ate it in

pleased anticipation based on its pretty colour. I must have been very small at the time, for I made my way down the backstairs to the kitchen, clambered onto a chair and so into the sink, where I was found presently by the cook, sitting with my tongue out under the cold tap, trying in vain to put out the fires.

Hepatica was still cropping up everywhere on this slope and among the leaves in the wood, when I discovered my first Bloodroot and Dog Tooth Violets. And here began a new chapter in the romance, for the Bloodroot I found was a "poppy" and the so-called violet or Yellow Adder's Tongue no less than a wild "lily." This path of botanical kinship was full of surprising turns, you never knew what you'd find just round the corner. It had all the comicality of a 3-legged race, with its dot-and-carry-one of incongruous pairs, columbine and kingcup, leek and orange lily, wood-nettle and elm, linking it along together. The day of the dog-tooth violet was also the day of my first real violet, the little white fragrant kind of the swamp; and in a few days I had found three or four species, each in turn more beautiful than its fellows, all with the same sweet wistfulness in the face of them and delicate pencilling of eyelashes. It was while I was still bending over the violets, as it seems to me, that I suddenly noticed the woods were full of fairy troops; they had stolen a march upon me; really the best way to see the fairies is to pretend you're not looking for them; then they peep out from under the leaves and creep from the hollows. They were all round me—"Jack-in-the-pulpit," the "Steeplechimes" of New York's Governor (Clintonia), Bellwort, Wild Lily-of-the-Valley, Trilliums, Wake-robin, Twist-stalk, Solomon's Seal, Indian Cucumber, Ladies' Slippers, Wild Ginger, Goldthread, Baneberry, Crinkleroot, Dutchman's Breeches, Squirrel Corn, Bishop's Cap, Foamflower, Cranesbill, Milkwort, Shin-leaf, Starflower, Lousewort, Twinflower; what magic names and forms to conjure with, and bring the whole rout of Titania's court abroad among the maples! "A wood near Athens," or a sugar bush in old Ontario—what odds to the little folk?

It was from these beginnings that I swung down the great avenues of Flowering Plants; the way of Arrowhead and Arum, of Lily and Orchid; the way of Sweetgale, Sandalwood and Birthwort; the way of Crowfoot, Pink and Poppy, Sundew and Saxifrage, Rose, Jewelweed and Mallow, Enchanter's Nightshade and Bunchberry, all flowers with petals kept apart; and last, the way of the flowers with welded petals; and these, after the Lilies and Orchids, were my favorite flowers; fortunately, their prime was after midsummer, somewhat later than the hey-day of the Polypetalous tribe, so that I could dally awhile with the latter, before I need devote all my time, as sooner or later I must, to the beautiful Heaths, the Primulas and Gentians, Bluebells and Lobelias; but perhaps above all, to the great phalanx from Borage to Bladderwort, headed by the incomparable Figworts; in this family with its Speedwells, Turtleheads, Beardtongue, Monkey Flower, Hedge Hyssop and Gerardias, cousins of the lovely English Foxglove, I was never tired of working; adding species to species, and genus after genus, till every gap was filled.

The countless paths of marvel revealed to me along the way have served to fill a score of summers to the brim with beauty, and still no sign of exhaustion; they have made the addition of Ferns and Club-mosses to the Flowering Plants,

the visits to a new district, the tramps in England and Wales, the trips to Ireland and Scotland, one long revel of delight; and what began it all? A few hours of drudgery with a botanical key and half a mile of common dusty road, trodden casually one April afternoon at the end of a day in school.

After two years in Smith's Falls I accepted a private tutorship in the neighbouring town of Perth, with headquarters at the Rideau Lakes from April to October. My pupil was as ardent a nature lover as I was myself and there grew up between us a close friendship of the give-and-take kind. His paradise was bird land, and if I taught him half as much about flowers in our long summer rambles as I learned about birds, we have both good cause to be grateful.

No one can haunt the countryside for flowers so constantly as I did without storing up quite a fund of mental notes, conscious or unconscious, about their fellows, furred and feathered. Where I had missed at first the Skylark from the meadows, I came to look for the Horned Lark, the Meadow Lark, the Song Sparrow, the Vesper and the Bobolink; if I could no longer hear the Blackbird and the Thrush, I could listen to the Bluebird and the Robin, and train my ear to tell apart the notes of the Catbird and the Oriole; while, in the woods themselves, I learned to trace to their source a score of mysterious notes from Cuckoos, Flycatchers, Thrushes, Vireos and Warblers—the Wetfoot, the Wood Pewee, the Veery, the Oven Bird, the Redeye and the Yellowbird. About the swamps and marshes of the Rideau abounded Grackles and Soldier-birds, Mudhens, Grebes, Bitterns and Herons; sometimes we flushed a Woodcock or caught a rare glimpse of Gallinule, Green Heron or Least Bittern. It was here that I first met the Great Northern Diver, the immortal Loon, and learned to admire its mastery of the watery element. One day, too, on the Lower Rideau, I had a unique experience; I was trolling slowly round a small island within a few yards of its wooded shore when I surprised a loon on its nest; in a flash it scrambled down the bank and made a running dive for the open, actually passing just under the bow of my little skiff; I could see the bird so distinctly as to note the powerful oarage of its great black webs, but what astonished me most was to see that its wings were not closed tight to the sides, but thrust partly forward and out, so that the water streamed away in greenish bubbles over the edge of the pinion; the wings must of course be used like fins to keep the bird on an even keel and plane up or down when submerged in its limpid depths.

Soon after dusk the loon suffers disembodiment and all night long you may hear from some abode of lost souls its wild cries and shouts of maniacal laughter. Sound is the strangest of all our bodily sensations; objects of sight have nothing mysterious about them; there they are before us plain to the view, and easily verified if we choose by touching or handling; but sounds are a thing apart, unsubstantial, the ghosts and wraiths of the ear. Ever since the race was in its infancy men have broken their hearts over an echo, and pined away with infinite yearning; we have peopled the night with all kinds of fabulous beings to be known only by their cries; the cuckoo, the white throat, and even the nightingale owe their charm to being hidden; to see the singer is to touch the magician and his virtue departs. When night or the leafy screen of the forest seals up the eyes, what a dance the imagination is led through that

other channel of sense, the ears! From earliest childhood, the voices of the night minister in each of us to the race's instincts of superstition and awe; the wind whistling in the chimney or rattling at the window, sighing and sobbing like some lost spirit; the weird music of the Whip-poor-Will or the Night Jar, the boding cry of the owl, the demoniac laugh of the loon, have all the power to call up ghoulish forms of primitive animism in our minds, out of the long dormant **paganism of our past**; come dawn and the sunrise, we chase them away for empty phantasms with a single sweep of the eye.

I remember, one autumn, a boy called in to ask my pupil over to his father's farm; a wild cat had been heard in the neighborhood, and he had better bring his gun. The next hour or two I spent in rapt attention to story after story about wild cats, lynxes and wolverines; their cunning, their daring and ferocity. Late at night the huntsman returned after a fruitless chase; several times he had heard the animal, but always at a distance, and nothing could be seen. Night after night the cries were repeated and gradually the thing grew bolder; till at last its cries were heard quite near our own cottage proceeding from a little orchard; my pupil stole out with the gun, and presently we heard a shot; the wild cat was dead; it was a little grey Screech Owl, one of the most beautiful creatures I have ever seen. Its cry is a long quavering whistle that comes rippling down the scale through several notes, quaintly suggestive of a pony's whinny; like so many of the owl-cries it is curiously deep, full and liquid, as though born of hollow wood and issuing from a vault more spacious than channelled reed-pipe.

About a mile away through field and wood lay a small lake famed afar for its bass. In stormy weather gulls came up the Rideau from the St. Lawrence, and on "Bass" Lake at such times we used to see a very beautiful bird from the coast known locally as the Sea-swallow; much smaller than the common Gulls, very graceful in flight, and with long narrow wings, perhaps the Least Tern.

In the height of the summer as we came home late at the end of a day's fishing, the groves seemed fairly alive with Whip-poor-Wills flogging the night with their strange whip-lash of a cry. It is not nearly so common a sight as its cousin, the Night Hawk, being more shy and seeking the seclusion of the woods both for feeding and nesting. The Night Hawk lays its eggs right in the open; often, in the city, its eggs may be found on the flat roofs, over which it flies hawking all the evening, or even in broad daylight when skies are grey. Both birds, though utterly defenceless, if surprised on their nest, will fly in the face and flutter threateningly just like the partridge. I remember the first time I went to the village of Lanark, in a search for orchids, what crowds of Night Hawks were in sight feeding over the swampy woods. Just outside the village was a high rocky ridge overhanging a great swamp of spruce, cedar and tamarac. After sundown at the end of my day's botany I would take up a position on the top of the slope to watch these birds; there were often two or three score of them in sight at once; they usually hunted in couples, though sometimes a string of five or six would go together (perhaps all of one sex) in zig-zag flight and with sharp cheeping cries; on a calm evening they seemed never to tire of their favorite game of diving; sometimes one of a pair (probably the male) would climb high up and then drop like a plummet past its mate in a

nose dive almost to the ground, when out shot the pinions and the tail seemed to flatten back as the daring aeronaut glided into the horizontal with a booming whirr of air through its feathers. If the game never palls on the bird, it certainly never palls on the human spectator, let him once contrast the clumsy barging movements of his own earth-bound body with the airy grace and swift power of living wings.

The finest spectacle of flight I ever watched was a game of just this kind played by a pair of bald-headed eagles on the Rideau. Here the birds took turns in soaring and diving, one bird floating almost motionless in mid-air while its mate soared in a bold spiral of immense sweep; suddenly from the dizzy top of its staircase the climber stooped, and plunged sheer down through the walls of space, apparently almost grazing the still form of the other in its descent; then with a faint bark or two of enjoyment it would flap and glide its way up into position to sleep outspread in mid-air, the floating target for its fellow's plunge. At first, as I have said, they took turns in this daring sport, and the game seemed to develop fresh variations in the very practice of it; sometimes there was a skirmish in mid-air, one dashing at the other on the level as though lunging out from the shoulder with a full-face blow; this the other would avoid by a sudden side-step or an upward leap; once the bird on guard stood its ground, and at the very instant of the fearful impact, suddenly the pair of them shot up in a double-headed geyser, rising rampant face to face, like game-birds at a cocking main, in the heat of their fierce encounter.

(To be Continued.)

THE NYMPH AND BREEDING PLACE OF *AESHNA SITCHENSIS* HAGEN (ODONATA).

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Aeshna sitchensis Hagen, one of the two smallest and most northern species of the genus in North America, has been known since 1861, but though it has been taken in a number of localities since then, from Atlantic to Pacific, almost nothing has been recorded concerning its habits and haunts.

The first time I came upon this species in numbers was on June 29, 1913, at Banff, Alberta (4,500 ft.). They were flying over a partly cleared area on the side of Sulphur Mountain below the Upper Hot Springs, probably not more than 500-600 feet above the town. All were young individuals with the colours not yet quite mature, so that I felt reasonably certain that if I could find their breeding place, the exuviae would be present and perhaps nymphs would be obtainable. Accordingly I searched all the likely looking ponds, lakes and streams I could find in the neighbourhood; but, although *Aeshna* nymphs and exuviae were found, they all belonged to *A. palmata* and *A. interrupta*.

During succeeding years, although I spent some time in northern localities, where this species is regional, I found no trace of it until the season of 1921. In July of that year I was again collecting in Banff, but spent two weeks there without seeing *Ae. sitchensis* at all. After visiting the Pacific Coast, however, I returned to Banff, spending a day and a half (Aug. 5 and 6) on the way at Field, B.C. (4,072 ft.).

About two miles west of the station, on the north side of the river, I found, at the foot of a mountain, a small mossy bog, fed by springs and by the seepage from a small cold mountain brook. The bog was partly enclosed by spruce forest and supported a scattered growth of stunted white spruce and willows, shrubby cinquefoil, and a few other swamp plants, but, excepting the moss, which was partly submerged, there was practically no aquatic vegetation, neither standing nor floating. Here were two species of dragonflies flying and ovipositing. One was *Somatochlora franklini* Selys, the other *Aeshna sitchensis*. The latter was the commoner of the two, but was far from numerous, the bog often appearing for many minutes at a time to be devoid of dragonfly life.

The males of *A. sitchensis* flew low, as a rule, only a foot or two from the ground, sometimes apparently at random over the bog, sometimes following the stream for some distance, but not covering a definite beat. They flew less swiftly than most *Aeshnas* and frequently dropped to the surface of the water for an instant, in a manner somewhat suggestive of an ovipositing female.

The females were frequently observed ovipositing in the wet moss about the edges of the small puddles in the bog, many of which were less than a square foot in area. The manner of oviposition was quite like that of other *Aeshnas*. The insect would light on the moss and thrust the abdomen into it in various directions, following no regular plan. Usually she remained at one spot less than half a minute, then flew on a few yards and repeated the operation. Once or twice copulating pairs were seen to rise from the bog and fly to the neighbouring trees.

A prolonged search was made for nymphs and exuviae, but although *Somatochlora* exuviae and a few young nymphs were found, no trace of the early stages of *sitchensis* appeared.

I was now, however, on the right track. I had at last penetrated the mystery of this strange dragonfly's haunts, which proved to be the same as those of the equally little-known *Somatochlora franklini*. It may be recalled, however, that the correct solution of this puzzle was already hinted at by Mr. F. C. Whitehouse (Can. Ent., XLIX, 1917, p. 100), who says: "I incline strongly to the opinion that the true breeding of this northern insect is muskeg, which may account for the nymph being still unknown."

On August 5 I left Field and arrived at Banff on the same day. I told my friend, Mr. N. B. Sanson, Curator of the Rocky Mountain Park Museum, of my experience at Field, whereupon he kindly offered to conduct me to a bog which he thought might prove interesting in a similar way. This bog, which we visited on August 9, is at the foot of Mount Rundle, and proved to be very like the one at Field, but much larger and in every way more productive. It appeared to be fed by seepage from a cold mountain stream. At the lower end of the bog there were two or three small ponds around which cat-tails and other standing aquatic plants grew, but the water was very cold and no dragonflies were seen in this part. The upper and middle parts of the bog were mossy and practically without standing aquatic plants and the open areas of water were mere puddles like those at Field. The water here was also warmer. One could walk through it without sinking more than a foot or so, if careful to pick out the firmer-looking moss hummocks.

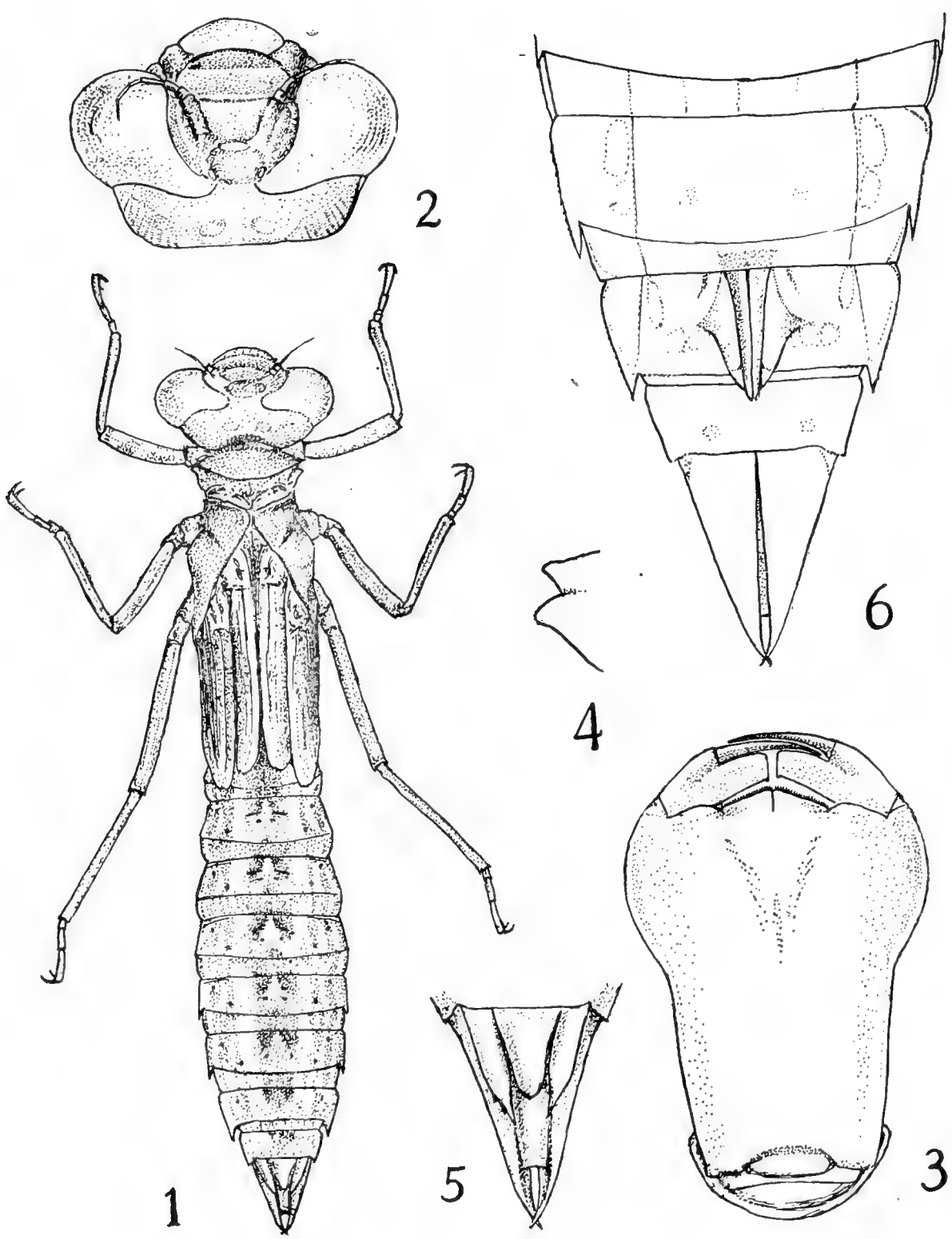
As in the case of the bog at Field, there were very few dragonflies here, but I soon observed *A. sitchensis* flying and ovipositing as before, and soon afterwards a *Somatochlora* was seen and captured. It was not, however, *franklini*, but a species which at present has no published name. *Somatochlora* exuviae were rather common and I obtained a full grown nymph, but for some time I found no trace of Aeshnas. After further search I found an exuvia, but was disappointed in recognizing it as *juncea*, a species that is abundant here about the small ponds in the marsh along the railway track, where I found many of the exuviae. At length, however, I found four small *Aeshna* exuviae of the penultimate stage, to judge by their wing-length, and one slightly larger exuvia of the final moult. These, which from their small size I had no doubt were *sitchensis*, were supplemented by three others on the following day. Males and females are represented by both stages.

These nymphs look like miniatures of *A. interrupta* or *eremita*, but resemble still more closely that of *A. coerulea* Ström, which was described recently by F. Ris (Mitteilungen der Schweizerischen Entomologischen Gesellschaft, Bd. XII, pp. 348-354, Taf. XIX, 1916). This was to be expected, as these two species are very nearly related and together form a distinct section of the genus *Aeshna*. The haunts of *coerulea* in Switzerland, as described by Ris, are also strikingly similar to those of *sitchensis*, as indicated by the following passages:—"es war an sehr mässig ansteigender Talflanke eine kleine, flache, ganz von Quellen ausgefüllte Mulde, ohne grössere Wasseransammlung, teilweise torfig, hauptsächlich aber über schieferigem Geröll mit massenhafter Vegetation von *Saxifraga aizoides*." (Op. cit., p. 350); and again, concerning another locality: "Sie flug nicht am See selbst, sondern auf quelligem und torfigem Gelände in seiner unmittelbaren Umgebung."

Aeshna coerulea is a circumpolar species, occurring in North America as the race *septentrionalis*. I took a single specimen of this form at Banff, in 1913, flying with *sitchensis*, and it is very probable that it breeds in the same places as the latter, though apparently very rare here.

DESCRIPTION OF THE NYMPH.

Nymph small and rather slender. Head as in *juncea* and *interrupta*, broadest across the middle of the eyes, which are a shade more prominent than in *interrupta*. Lateral margins of head short, passing through well-rounded angles into the posterior margin, which is straight or feebly excavated when viewed directly from above. Mentum of labium reaching back to middle of mesocoxae, very like that of *eremita* in form, basal breadth about three-fifths of the apical, greatest breadth four-fifths of the length; the sides nearly straight and feebly divergent from base to a point just beyond the middle, distad of which they are strongly arcuate. Middle lobe prominent, narrow and obtus-angulate, resembling that of *juncea* closely. Lateral lobes broad, the terminal parts subequal, squarely truncate, outer angle scarcely rounded, inner angle with a minute tooth. Supra-coxal processes rather short and blunt, subequal in length, the posterior slightly the stouter, the interval nearly rectangular. Abdomen broadest at segments 6 and 7, a little slenderer than in *interrupta*; lateral spines present on segments 7 to 9 only, those of 7 minute rudiments, those of 8 extending half way to the base of seg. 9, those of 9 as far as the



THE NYMPH OF AESHNA SITCHENSIS HAGEN

(See Page 226)

proximal fourth of 10. Inferior appendages scarcely longer than segs. 9 and 10 together, their apices distinctly incurved; median superior appendage about one-fourth shorter, the basal tubercle in the male triangular, with a blunt, rounded apex, about three-fourths as long as the paired superior appendages (lateral appendages), which in the male are rather more, in the female barely less, than half as long as the inferior appendages. Ovipositor extending over about one-fourth to one-third of seg. 10, the lateral gonapophyses (genital valves) a little shorter, just about reaching to the base of that segment.

Colour Pattern. Head almost uniform brownish, thorax with traces of paler mottlings in some specimens. Legs nearly uniform, with more or less distinct traces of two or three pale femoral bands, a median, an anteapical and sometimes a basal band. Abdomen brownish with pale markings almost exactly as in *cremita* and *interrupta*. Extending practically the entire length is an ill-defined brown median band, which tends to deepen in front of the dorsal punctae, typically forming paired submedian, \wedge -shaped spots at the front margins of most of the segments. This band is bordered laterally by a pair of pale bands, which are most distinct on the anterior segments, and on the anterior part of each segment, forming in dark specimens a subcontinuous series of pale spots. Laterad of these bands is a series of subcrescentic pale spots and a broad marginal pale area, just enclosing the lateral scars, which are outlined in brown. Punctae all dark brown.

Length of body 31.5 to 32.5 mm.; mentum of labium 4.5 to 5.0 mm.; hind wing-pads 7.5 mm.; hind femora 5.5 mm.; inf. apps. 3.0 to 3.25 mm.; ovipositor 2.25 to 2.5 mm.; width of head 7 mm.; width of abdomen 6 mm.

The immature exuviae are similar to the full-grown examples, except in size and length of wing-pads and genitalia. The paired superior appendages of the males are only about three-eighths the length of the inferior pair, and the ovipositor does not quite reach to the posterior margin of seg. 9. The colour pattern is similar but darker, and with more distinct markings than in most of the full-grown exuviae. All are of about the same size and the measurements are as follows:—

Length of body 29 mm.; mentum of labium 3.5 mm.; hind wing-pad 3.5 mm.; hind femora 4.5 mm.; inferior appendages 2.75 mm.; ovipositor 6.0 mm.; width of head 6.0 mm.; width of abdomen 5.5 mm.

As these exuviae evidently belong to the penultimate stage and as the period of emergence was long over when they were taken, it is evident that the nymph of *Aeshna sitchensis* enters the last stage during the season before that in which it emerges. This appears to be the usual habit in boreal Odonata.

As compared with Ris's description and excellent photographs of the female exuvia of *A. coerulea*, that of *sitchensis* is seen to differ very little except in the form of the labium and the somewhat shorter caudal appendages. The body of *sitchensis* is somewhat more slender, as is also true of the adults, and the head is a little wider than the thorax, whereas in *coerulea* it appears to be of about the same width. The mentum of the labium is distinctly broader in *sitchensis*, its greatest breadth being equal to fully four-fifths of its length, while in *coerulea* it is equal to about two-thirds of its length. The inferior paired appendages, besides being shorter, appear to be more strongly incurved

at the apices than in *coerulea*, though the curving is quite noticeable in the figure of *coerulea*. The lateral spines on segments 8 and 9 of the abdomen appear to be a trifle shorter in *sitchensis*.

The nymphs of these two related species are readily distinguished from all other known nymphs of North American species of *Aeshna* by the entire lack of lateral spines on the 6th abdominal segment. The nymph of *sitchensis*, like the adult, is on the whole the smallest of North American species, though *coerulea septentrionalis* is often no larger. *A. californica* is the only other species that is comparable to these two in its small size.

EXPLANATION OF PLATE.

***Aeshna sitchensis* Hagen.**

Fig. 1. Exuvia of full-grown male nymph. The head is slightly bent forward.

Fig. 2. Head of same, direct dorsal view.

Fig. 3. Labium (closed), ventral view.

Fig. 4. Left supra-coxal process.

Fig. 5. Caudal appendages of male, dorsal view.

Fig. 6. Terminal abdominal segments of female nymph, ventral view.

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA).

BY JOHN D. TOTHILL,

In charge of Natural Control Investigations, Entomological Branch, Ottawa.

(Continued from Page 205.)

DESCRIPTION OF SPECIES.

***Ernestia (Meriania) flavicornis* Brauer.**

Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi yellow. Eyes hairy, cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height; sides of face covered with silvery pollen; with some weak hairs on the upper part; narrowest width equal to or slightly greater than the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments rufous; third segment about one and one-fourth times as long as the second. Arista thickened on basal two-fifths to three-fifths, the penultimate segment slightly longer than broad. Width of front in male equal to the length of, in the female equal to two and a half times the length of, the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point equal in male and twice in female the width of either side of front just cephalad of the ocellar triangle. Orbital bristles present in female, absent in male. Ocellar bristles absent in male, present and proclinate in female; the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes faintly rufous toward the apex. Three sternopleural macrochaetae and typically four dorsocentrals, although both sets are subject to considerable variation; scutellum with four marginal pairs of macrochaetae and with an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3} . Bend of M_{1+2} destitute of an appendage. Radio-medial cross vein cloudy. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. No discal macrochaetae present on the second abdominal segment, but a pair on each of the following segments; marginals present on the second, third and fourth. The hind margin of the third tergite not arcuate even in the male. The fifth tergum in the male marked off distinctly by a suture from the fourth and about one-fifth as long as the fourth. The sixth and seventh abdominal segments forming genital segments that are noticeably smaller than in *E. ampelus* Walker and the other species described in this paper.

Genital segments of the male black. The basal part of the outer forceps not covered by a leaf-like expansion. The basal part of the inner forceps without a median keel-like projection; the distal part forming a straight, bayonet-shaped blade.

The indenture in the last sternite of the male extends to the base of the sternite so that the sternite is split longitudinally into two halves.

Redescribed from six males and four females in the U.S.N.M. collection and in the Canadian National collection. Collected from the White Mountains, Franconia, N.H.; Mandan, N.D.; Cranbrook, B.C.; and Lillooet, B.C.

***Ernestia (Meriania) nigrocornea* sp. n.**

Description of Male. Head at vibrissae about as thick as at base of antennae, vibrissae far above the oral margin. Palpi reddish. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground with black hairs on the subshining part, coming nearly up to the eyes and with a row of stouter hairs at the oral margin. Distance from the oral margin to base of eye equal to about one-half the eye height. Sides of face silvery pollinose; bare, except for a few sparse hairs, particularly at the upper part; narrowest width equal to about twice the length of the second antennal segment. Facial ridges bristly on lowest third. Facial depression silvery pollinose without any carina. Antennae reaching lowest three-fourths of the face, all three segments black or very dark-brown in color; third segment about twice as long as the second. Arista thickened on basal half; the penultimate segment scarcely longer than broad; width of front at narrowest point measuring about twice the length of the second antennal segment; silvery pollinose; frontal vitta dull, dark-reddish brown, at narrowest point measuring almost half the width of front at vertex. No orbital bristles; the frontal bristles extending nearly to the base of the third antennal segment. Ocellar bristles well-developed and proclinate..

Thorax subshining, black, covered with gray pollen; scutellum gray

pollinose on a black ground, tinged reddish at the apex. Three sternopleural bristles and four pairs of dorsocentrals; scutellum with four pairs of marginal bristles and an apical pair that may, or may not, be cruciate. (These are broken off in the type specimen). Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs at the base on both the upper and lower surface. M_{1+2} with a distinct appendage at the bend. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground, the lateral parts of the first three segments somewhat rufous. Discal bristles absent on segments one, two and three, a pair of median marginal macrochaetae on segments two, three and four. The fifth tergum distinctly marked off from the sixth; the greatest width of the fifth equal to about one-fifth the narrowest width of the fourth segment. The sixth abdominal segment about three-fourths the length of the fourth and forming a conspicuous genital segment.

The black-colored genitalia are characterized by the absence of a keel-like projection at the base of the inner forceps, by the extraordinary length of the apical blade-like portion of the inner forceps and by the unusual degree of lateral compression of each of the apical portions of the outer forceps. The broad, leaf-like expansion covering the base of the outer forceps in so many of the *Ernestia* species is lacking in this species.

The indenture of the fifth sternite extends nearly to its base.

Described from a single male taken by Mr. E. C. Van Dyke at Lake Tahoe, California, on September 15th.

Type in the Canadian National Collection at Ottawa.

***Ernestia frontalis* sp. n.**

Description of Male. Head at vibrissae about as thick as at base of antennae; vibrissae close to the oral margin. Palpi yellowish at tip, infusate below. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments black; third segment about one and one-fourth times as long as the second. Arista thickened on basal half, the penultimate segment slightly longer than broad. Width of front at narrowest point measuring about three-fourths the width of an eye and about twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point fully twice as wide as either side of front just cephalad of the ocellar triangle. No orbital bristles, the proclinate ocellars somewhat weak; the single row of frontal bristles descending to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen, scutellum gray pollinose on a black ground that becomes rufous toward the apex. Three sternopleural bristles and typically four dorsocentrals; scutellum with three

marginal pairs of macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3} . Bend of M_{1+2} with an appendage. An unusually long costal spine. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segment. The hind margin of the third abdominal segment not arcuate. The fifth tergum marked off distinctly from the shining sixth, and at the lateral part being about one-fifth the length of the lateral part of the fourth. The sixth and seventh abdominal segments forming the not very prominent genital segments.

Genitalia black. The basal part of the outer forceps without a leaf-like expansion. The basal part of the inner forceps without a median keel-like portion.

The horseshoe-like indenture extends almost to the base of the last sternite.

Described from two males from Yukon River, Alaska, and Cranbrook, B.C., taken by Messrs. Harrington and C. Garrett.

Type Number 24,352 in the U.S.N.M., Washington, D.C., the paratype in the Canadian National Collection, Ottawa.

***Ernestia johnsoni* sp. n.**

Description of Male. Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi yellow in the type material. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground with black hairs coming nearly up to the eyes and with a row of stouter hairs at the oral margin. Distance from the oral margin to base of the eye equal to about one-third the eye height. Sides of face silvery pollinose; bare; narrowest width of the front slightly greater than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose without any carina. Antennae reaching the lowest fourth of face, all three segments black; third segment about one and one-half times as long as the second. Arista thickened on basal two-fifths, the penultimate segment scarcely longer than broad. Width of front at narrowest point measuring a little more than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown; at narrowest point about twice as wide as either side of the front immediately cephalad of the ocellar triangle. No orbital bristles, the proclinate ocellars somewhat weak; the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground, in most specimens tinged reddish, especially at the apex. Typically three sternopleural bristles, but they are variable; typically four dorsocentral macrochaetae, some specimens with only three; scutellum with three marginal pairs of macrochaetae and with an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer

side; wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3} . Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal macrochaetae present on the second, third and fourth abdominal segments; median marginals present on the same segments. The hind margin of the third tergum strongly arcuate. The fifth tergum pollinose and marked off from the shining sixth tergum by a somewhat faint suture. The greatest length of this segment is about one-fifth the lateral length of the fourth tergite. The sixth and seventh abdominal segments forming somewhat distended genital segments. Genitalia black. The basal part of the outer forceps is expanded into a broad, leaf-like portion. The basal part of the inner forceps is equipped with a short, median, keel-like projection, the two edges of which are almost straight in profile.

The horseshoe-like indenture extends very slightly more than halfway to the base of the fifth sternite.

Described from four males from Wellesley, Mass., (type locality) Melrose Highlands, Mass.; North Saugus, Mass., and Fry Creek, B.C.

One specimen bred from *Hyphantria cunea* Drury. This species should not be confused, however, with *E. ampelus* Walk., which is a major parasite of *Hyphantria*.

Type number 24,353 in the U.S.N.M., Washington, D.C. A paratype from Fry Creek, B.C., in the Canadian National Collection, Ottawa.

This species is named in honor of Mr. C. W. Johnson, whose name is inseparably associated with the Dipterology of the Atlantic seaboard.

(To be Continued.)

ON SOME CHILOPODS AND DIPLOPODS FROM KNOX CO., TENNESSEE.

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

The chilopods and diplopods here listed compose a collection made in Knox Co., Tenn., during Jan. and Feb., 1921, by Mr. Geo. G. Ainslie, by whom they were transmitted to the writer for study.

CHILOPODA.

1. *Cryptops hyalinus* (Say).

One specimen of this widespread southern form.

2. *Otocryptops sexspinosus* (Say).

One specimen.

3. *Linotaenia fulva* (Sager).

One specimen.

4. *Sonibius rex* (Bollman)

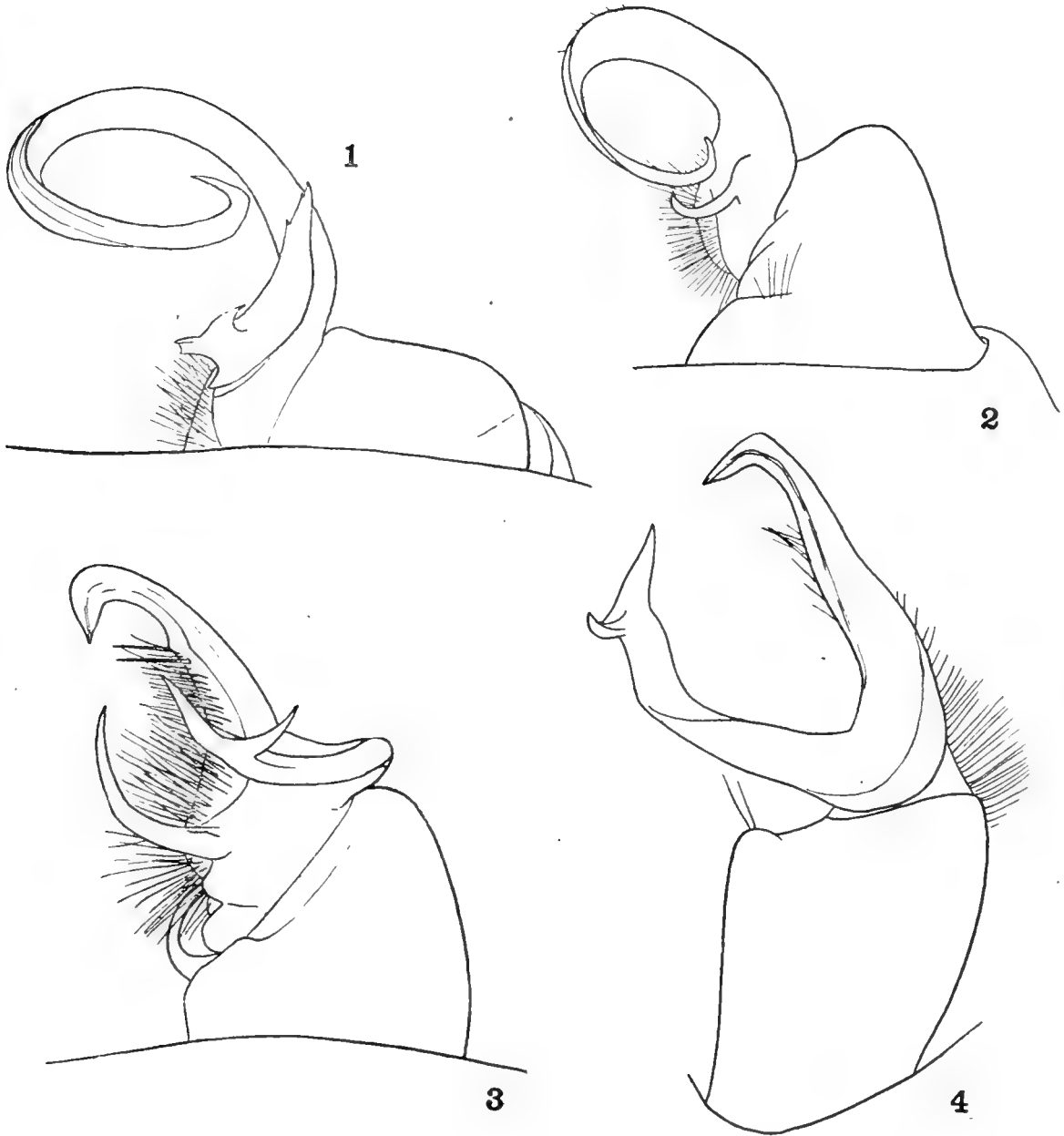
Lithobius rex Bollman, Proc. U. S. Nat. Mus., 1888, 11, p. 350.

One male of this species was taken at Elkmont, elevation 3,500 feet, on Feb. 15. It was previously known only from the type, which is a female.

DIPLOPODA.

5. *Platydesmus lecontei* (Wood).

One specimen.



CHILOPODS AND DIPLOPODS FROM TENNESSEE.

1. *Apheloria ainsliei*, sp. n., right gonopod, anterior view.
2. *Apheloria montana* (Bollman) right gonopod, anterior view.
3. *Pachydesmus retrosus* sp. n., right gonopod, anterior view.
4. The same, ectal view. All x 16.

6. *Callipus lactarius* (Say).

One specimen of this common and widespread form.

7. *Euryurus erythropygus* (Brandt).

A number of specimens, mostly not in full color.

8. ***Pachydesmus retrorsus*, new species.**

Above, light brown or fulvous to fuscous when in full color, with keels a lighter brown.

No processes from sternite between third or fourth legs or from any others. First joint of legs also unarmed.

The gonopods are of the same general type as in *crassicutis* (Wood), but are at once differentiated in having the spur toward distal end of outer (anterior) branch of telopodite much longer and retrorse, as well as in other details. See Pl. ix, figs 3 and 4.

Length, about 65 mm.; width, 12.75 mm.

Locality—Tennessee, Knox Co., Geo. G. Ainslie, collector.

Type—M. C. Z., No. 5028.

***Apheloria*, new genus.**

Erected for a group of species, heretofore included in *Fontaria*, in which the telopodite of the gonopod of male is a simple, coiled blade with a small spur at base.

Genotype—*Fontaria montana* Bollman.

9. *Apheloria montana* (Bollman).

Fontaria montana Bollman, Proc. U. S. Nat Mus., 1887, 10, p. 622.

Six specimens. The gonopod as shown in Pl. ix, fig. 2.

10. ***Apheloria ainsliei*, new species.**

The dorsum is black or nearly so but with a broad band across caudal border and forward over keels of each segment fulvous brown to light olive, the latter being more typical; the median part of cross band sometimes obscure, but the keels always of the lighter color. Antennae dark brown. Legs fulvous.

Second joints of legs with the usual long spine; the first joints with a low conical eminence but this not at all spiniform.

This species is characterized by having the telopodite of gonopod bent into a complete circle, or a little more, and by the form of the basal spur which presents a main branch appressed to base of telopodite with apex distad and a flat, dentate branch extended mesad as shown in Pl. ix, fig. 1.

Length, about 45 mm.; width, 13 mm.

Locality,—Tennessee: Knox Co. Geo. G. Ainslie, coll. Several specimens.

Type,—M.C.Z., No. 5,027.

11. *Polydesmus branneri* Bollman.

Two males taken at Knoxville in Jan., and two females taken Feb. 15.

12. *Scytonotus granulatus* (Say).

A male and two females.

13. *Parajulus impressus* (Say).

Many immature females taken 24 Feb.

14. *Parajulus pennsylvanicus* (Brandt).

Two males taken in Jan.

15. *Parajulus annectans*, new species.

Closely related to *P. nigrans* Chamberlin, described from near Nashville, which it much resembles in its small size, though more slender, and in its dark coloration. The dorsum above the repugnatorial pores, however, is lighter, having a reddish tinge, and is marked with a median longitudinal dark line.

In the original description of *nigrans* the anal tergite is said not to exceed the valves, but reexamination shows this to be due to the fact that the valves are not fully closed. In the present species the anal tergite is acutely produced well beyond the valves, the mucro straight.

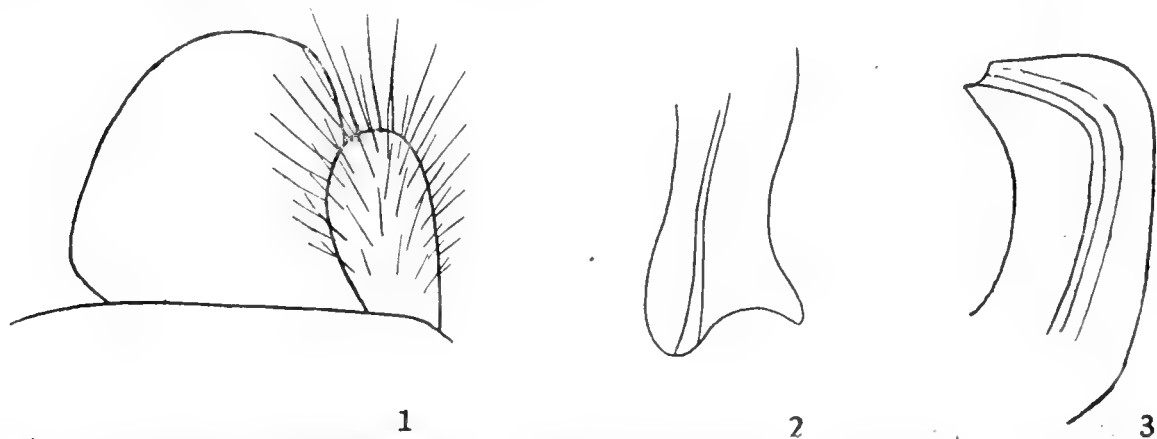


Fig. 1.—1. *Parajulus annectans* sp. n. Anterior gonopod of left side, ectal view, x72. 2. Tip of telopodite of right posterior gonopod, ectal view, x115. 3. *Parajulus nigrans* Chamb. Tip of telopodite of left posterior gonopod, ectal view, x115.

The two species are clearly distinct in the structure of the gonopods of male, although in this closer to each other than to any other known species. In *annectans* the posterior division of the anterior gonopods is broader and shorter relatively to the anterior division, distally broadly rounded, not distally narrowed and bent in mesad. The principal blade of the posterior gonopod is covered in lateral view by the anterior gonopod, whereas in *nigrans* it descends well below the level of the anterior member; distal end in *annectans* with distoventral corner angled and extended ventrad as shown in fig. 1, 2 instead of being rounded as it is in *nigrans*. (See fig. 1, 3). Anterior gonopod as shown in fig. 1, 1. Spine from base of posterior gonopod long and acute, extending ventrad.

Number of segments, forty-eight.

Locality,—Tennessee: Knox Co. One male.

Type,—M.C.Z., No. 5,024.

16. *Spirobolus marginatus* (Say).

Two large specimens taken at Elkmont, el. 3,500 ft., and one at Knoxville.

NEW ENGLAND HEMIPTERA-HETEROPTERA.

NEW RECORDS. II.¹

BY H. M. PARSHLEY,

Smith College, Northampton, Mass.

During the four years which have elapsed since the publication of my New England List of Hemiptera-Heteroptera² I have made an effort to keep track of all additions to this fauna which have come to light. In 1919 I published

¹ Contributions from the Department of Zoology, Smith College, No. 82.

² Occas. Papers of the Boston Society of Natural History. VII. Fauna of New England. 14. List of the Hemiptera-Heteroptera, August, 1917.

a formal supplement,³ and later some other papers⁴ with new data, while several works (cited hereinafter) have appeared, in which new species from our region are described. The examination of various collections has also afforded additional information on our fauna. All the new data thus gathered since the first supplement are collected here, bringing the New England enumeration down to date.

In the original list 419 species were recorded, one of which has since been removed as a synonym.⁵ In the first supplement 15 species⁶ were added, and in the present paper 39 more, which brings the total number of Heteroptera now known to inhabit New England to 472. It is worthy of note that of these newly recorded members of our fauna 31 are species described since the publication of the original List in August, 1917, especially in revisions of *Aradus* and *Phytocoris*, genera which previously had been little studied, and that the other additions number only 22, or about 5% of the first enumeration.

In the following pages the species given in bold-face type are recorded as additions to the New England fauna, while the others are in almost all cases new to the various State lists. For collectors' names see the original paper.

PENTATOMIDAE

Sciocoris microphthalmus Flor.

ME.—Cumberland County, 1916 (*A. Nicolay*).

Peribalus limbolarius Stal.

ME.—Peaks Island, 3 Aug. '18 (*G. A. Moore*).

Euschistus politus Uhler.

CONN.—Portland, 20 July '19 (*B.H.W.*).

Mineus strigipes (Herrich-Schaeffer).

CONN.—New Canaan, 12 Sept. '18 (*M.P.Z.*).

ARADIDAE.

ARADINAE

Aradus robustus Uhler.

N.H.—Three Mile Island, 27 May, '08 (*F.B.*)

Aradus duzei Bergroth.

MASS.—Northampton, 17 May '19 (*Dorothy Merchant*).

Aradus proboscideus Walker. (= *A. hubbardi* Heid. of the List.)

N.H.—Mt. Washington, Summit (*A.T.S.*).

Aradus basalis Parshley.

Trans. Am. Ent. Soc., XLVII:54, 1921.

ME.—Holden, 20 June '02 (*F.A.E.*); Mt. Katahdin, 9 Aug. '02 (*H.G.B.*).

N.H.—Mt. Washington, Summit (*A.T.S.*): Temple, 26 May '00 (*F.B.*)

Aradus consors Parshley.

Op. cit., p. 56.

MASS.—(*S.H.*).

³ N.E. Hem-Het. New Records, Can. Ent., LI:70-72, 1919.

⁴ Hem. Peaks Island, Maine, Can. Ent., LII:80-87, 1920.

Hem. Western N.E., Psyche, XXVII:139-143, 1920.

⁵ *Melanorhopala obscura* Parsh.=*M. clavata* Stal.

⁶ *Corythucha pallipes* Parsh, now includes *C. cyrta* Parsh. and *C. betulae* Drake.

Aradus similis Say.

N.H.—Durham, 19 Apr. '06 (*C. S. Spooner*).

Aradus shermani Heidemann.

ME.—Orono, 22 May '14 (*H.M.P.*).

Aradus inornatus Uhler.

ME.—Orono, 1 May '14 (*H.M.P.*).

N.H.—Claremont, June-Oct.; Hanover (*C.M.W.*); Merrimack, 11 May '00 (*F.B.*).

MASS.

Aradus approximatus Parshley.

Op. cit., p. 72.

ME.—Mt. Katahdin, 26 Aug. '02 (*H.G.B.*).

Aradus borealis Heidemann.

ME.—Mt. Katahdin, 5215 ft., 19 Aug. '02 (*H.G.B.*).

Aradus insignitus Parshley.

Op. cit., p. 75.

MASS.—(*F. G. Sanborn*).

Aradus abbas Bergroth.

N.H.—Mt. Washington; Three Mile Island, 23 May '08 (*F.B.*)

Aradus falleni Stal.

R.I.—Providence (*C.A.D.*).

CONN.—New Haven, 18 June '19 (*M.P.Z.*).

Aradus cinnamomeus Panzer.

MASS.

Aradus niger Stal.

ME.—S. W. Harbor, 11 July '18 (*C.W.J.*).

MASS.—Northampton, 8 Oct. '19 (*Ottillie Meiner*); Pelham, 28 Aug. '19 (*H.M.P.*).

MEZIRINAE.

Neuroctenus simplex Uhler.

CONN.—Branford, 6 April '21 (*M.P.Z.*).

NEIDIDAE.

Neides muticus (Say).

Vt.—Haystack Mt., 5 Sept. '19 (*H.M.P.*).

LYGAEIDAE.

Geocoris uliginosus (Say).

CONN.—New Haven, 11 July '20 (*B.H.W.*).

Perigenes constrictus (Say).

CONN.—Salem, 12 July '14 (*H.W.F.*).

Zeridoneus costalis (Van Duzee).

Barber has recently proposed⁷ the new genus *Zeridoneus* for *Perigenes costalis* (List, page 49). The Boston record pertains to *P. constrictus*.

⁷ Concerning Lygaeidae, No. 1, Jour. New York Ent. Soc., XXVII:45, 1918. Synop, Keys Lyg. II., Psyche, XXV:76, 1918.

Ptochiomera clavigera Uhler.

MASS.—Dracut.

CONN.

Pseudocnemodus canadensis (Provancher).CONN.—Salem, 22 July '14 (*H.W.F.*).*Kolenetrus plenus* (Distant).ME.—Peaks Island, 26 July '18 (*G. A. Moore*).**Stygnocoris rusticus** (Fallén).ME.—Peaks Island, 31 July '18, 8 Aug. '19 (*G. A. Moore*).*Emblethis vicarius* Horváth.MASS.—Northampton, 7 Oct. '20 (*H.M.P.*)**Microtoma atrata** (Goeze).

Barber, Concerning Lyg., No. 2, Jour. New York Ent. Soc., XXVI:61, '18.

R.I.—(Uhler collection; locality possibly incorrect).

TINGIDAE.

Stephanitis pyrioides (Scott).CONN.—New Canaan, 20 Sept. '19 (*P. Garman*).**Corythucha pyriformis** Parshley.

Can. Ent., LII:81, 1920.

ME.—Peaks Island, 31 July '19 (*G. A. Moore*).N.H.—Franconia (*A.T.S.*).**Corythucha heidemanni** Drake.VT.—Woodford, 5 Sept. '19 (*H.M.P.*)**Corythucha ulmi** Osborn and Drake.N.H.—Durham (*C.M.W. and W.F.F.*),**Corythucha mollicula** Osborn and Drake. (= *C. salicis* O.&D., List, p. 119.)

Drake, Notes Am. Ting., Florida Ent., March, 1921, p. 53.

ME.—Orono, 16 July '06.

Leptoypha mutica (Say).MASS.—Lexington, 25 June '20 (*G. W. Barber*).*Physatocheila brevirostris* Osborn and Drake.CONN.—New Haven, 5 July '20 (*B.H.W.*).*Alveotisingis grossocerata* Osborn and Drake.CONN.—New Haven, 5 July '20 (*B.H.W.*)

NABIDAE.

Nabis sordidus Reuter.CONN.—Guilford, 13 July '20 (*B.H.W.*)*Nabis roseipennis* Reuter.VT.—Haystack Mt., Sept. '19 (*H.M.P.*).*Metatropiphorus belfragii* Reuter.CONN.—Pleasant Valley, Litchfield Co., 1 Aug. '15 (*G.P.E.*)

ANTHOCORIDAE.

Tetraphleps americana Parshley.

Can. Ent., LII:84, 1920.

ME.—Peaks Island, 3 Aug. '19 (*C. A. Moore*).

Tetraphleps uniformis Parshley.*Op. cit.*, p. 85.N.H.—Mt. Washington (*A.T.S.*).

MIRIDAE

Phytocoris pallidicornis Reuter.⁸Vt.—Haystack Mt., 5 Sept. '19 (*H.M.P.*).*Phytocoris eximius* Reuter.

Knight, Bull. Brooklyn Ent. Soc., XV:51, 1920.

ME.—Casco Bay, 27 Sept. (*G.P.E.*).MASS.—Northampton, 27 Sept. '18 (*H.M.P.*).**Phytocoris neglectus** Knight.*Op. cit.*, p. 54.ME.—N.E. Harbor, 26 July (*C.W.J.*).MASS.—Boston, 13 Oct. '15 (*H.M.P.*), and nearby stations; Woods Hole, 15 July-6 Aug. (*C.E.O.*).**Phytocoris onustus** Van Duzee.

Proc. Calif. Ac. Sci., (4) IX:344, 1920.

Knight, *Op. cit.*, p. 54.ME.—Machias, 22 July '09 (*C.W.J.*); Mt. Katahdin, 650 ft., 22 Aug. '13 (*C.P.A.*).N.H.—Glen House, 24 July '15 (*C.W.J.*)Vt.—Haystack Mt., 5 Sept. '19 (*H.M.P.*) (Det. ? by Knight).**Phytocoris spicatus** Knight.*Op. cit.*, p. 55.ME.—Machias, 19 July '09 (*C.W.J.*).MASS.—Lunenburg, 15 July '16 (*H. W. Allen*).**Phytocoris cortitectus** Knight.*Op. cit.*, p. 55.N.H.—Glen House, 24 July '15 (*C.W.J.*).**Phytocoris salicis** Knight.ME.—Machias, 26 July '15 (*C.W.J.*).N.H.—Hanover, 3 July '15 (*C.W.J.*).MASS.—Beach Bluff, 11 Aug. '15 (*H.M.P.*); Lunenburg, 22 July '16 (*H. W. Allen*); Sunderland, Mt. Toby, 6 July '18 (*H.M.P.*); Woods Hole, 6 Aug. (*C.E.O.*).CONN.—Branford, 15 July (*H.W.W.*).**Phytocoris buenoi** Knight.*Op. cit.*, p. 57.MASS.—Marblehead, 24 July '14 (*H.M.P.*); Woods Hole, 6 Aug. (*C.E.O.*).CONN.—New Haven, 27 June (*W.E.B.*)**Phytocoris erectus** Van Duzee.

Proc. Calif. Ac. Sci., (4) IX:345, 1920.

Knight, *Op. cit.*, p. 57.

⁸ This species and *P. onustus* Van Duzee, ♀, (?) are incorrectly recorded as *P. lasiomerus* and *P. eximius* on page 142 of the second paper cited on p. 234, foot note 4, through a clerical oversight.

ME.—Ft. Kent, 19 Aug., '10 (*C.W.J.*); Penobscot Co., 1 Aug., '10 (*J.A.C.*)
N.H.—Crawfords, 28 Sept. '16 (*H.M.P.*).

MASS.—Brookline, 25 Sept. (*C.W.J.*); Chester, 3 Aug., '12 (*C.W.J.*);
Plymouth, 28 July (*C.W.J.*).

Phytocoris penipecten Knight.

Op. cit., p. 58 (*P. penipectus*, *laps. cal.*)

MASS.—Amherst.

CONN.—East River (*C.R.E.*); New Britain, Sept. (*W.E.B.*).

Phytocoris fulvus Knight.

Op. cit., p. 59.

ME.—Peaks Island, 31 July '18 (*G. A. Moore*).

Phytocoris conspersipes subsp. **diversus** Knight.

Op. cit., p. 60.

ME.—Liberty, 16 Sept. '13 (*J.A.C.*).

N.H.—Franconia (*A.T.S.*).

MASS.—Northampton, 1 Oct. '20 (*H.M.P.*).

Phytocoris quercicola Knight.

Op. cit., p. 60.

MASS.—Beach Bluff, 27 Aug. '14 (*H.M.P.*).

Phytocoris conspurcatus Knight.

Op. cit., p. 61.

MASS.—Beach Bluff, 24 Aug. '16 (*H.M.P.*), at light; Boston, 9 Aug.
(*H.M.P.*)

CONN.—Hartford, 12 Sept. (*W.E.B.*); Wallingford, 3 Aug. '12 (*D.J.C.*).

Phytocoris corticeviventis Knight.

Op. cit., p. 63.

ME.—Orono, July '12.

CONN.—Lyme, 4 July (*H.B.K.*); New Haven, 20 June '11 (*A.B.C.*)

Phytocoris sulcatus Knight.

Op. cit., p. 64.

MASS.—Boston, 20 July (*H.M.P.*).

CONN.—Branford, 22 Aug. (*H.W.W.*).

Phytocoris tibialis Reuter.

ME.—Peaks Island, 3 Aug. '19 (*C. A. Moore*).

Paracalocoris hawleyi var. *ancora* Knight and var. *pallidulus* McAtee.

Ann. Ent. Soc. Amer., IX:378, 1916.

MASS.—Sunderland, Mt. Toby, 6 July '18 (*H.M.P.*)

Lygus apicalis Fieber.

MASS.—Edgartown, 22 Aug. '12 (*C.W.J.*); Provincetown, 8 Sept. '90.

Camptobrochis borealis Van Duzee.

Proc. Calif. Ac. Sci. (4) IX:354, 1920.

ME.—Portland, 4 July '09 (*E.P.V.D.*).

Alepidia gracilis (Uhler).

MASS.—Arlington, 30 July '20 (*G. W. Barber*).

Orthocephalus mutabilis (Fallén).

ME.—Southwest Harbor, 14 July '18 (*C.W.J.*).

Macrotylus sexguttatus (Provancher).MASS.—Lexington, 25 June '20 (*G. W. Barber*).

GERRIDAE.

Gerris marginatus Say.VT.—Woodford, 5 Sept. '19 (*H.M.P.*).***Rheumatobates rileyi* Bergroth.**MASS.—Northampton, 22 Aug. '19 (*H.M.P.*).VT.—Woodford, 5 Sept. '19 (*H.M.P.*).

VELIIDAE.

***Microvelia buenoi* Drake.**

Bull. Brooklyn Ent. Soc., XV:20, 1920.

ME.—Orono, 3 May '14 (*H.M.P.*).MASS.—Northampton, 22 April '21 (*H.M.P.*); Saugus, 27 August '17 (*H.M.P.*).

This minute species, recently described from the Adirondacks, has just been found in large numbers in a small campus pond, where no *Microvelia* has previously occurred. Nymphal and adult stages were present. It may be readily distinguished from the equally small *M. borealis* Torre-Bueno by its shorter and thicker third antennal segment, which is clavate, not linear, the straight posterior tibiae in the male, and the conspicuous tufts of long silvery pubescence which ornament the abdomen in the apterous form. The Maine record in the List, page 108, pertains to *M. buenoi*, not to *M. borealis*, according to material now in my collection.

***Microvelia hinei* Drake.**

Ohio Jour. Sci. XX:207, 1920.

MASS.—Northampton, 22 June '21, 3 Oct. '21 (*H.M.P.*).

In antennal structure this species resembles the preceding, but it is still smaller, shows little sexual dimorphism, and in the apterous condition is very brightly colored, though without dorsal silvery pubescence on the abdomen.

***Microvelia albonotata* Champion.**MASS.—Northampton 22 June '21 (*H.M.P.*):

HEBRIDAE.

Hebrus burmeisteri Lethierry & Severin.MASS.—Northampton, 22 June '21 (*H.M.P.*).

I am not certain of the proper application of the names, *H. burmeisteri* and *H. concinnus* Uhl., and they may be synonymous as the published distribution would seem to indicate; or it is possible that *concinnus* is in reality a West Indian species, distinct from the one common in the eastern United States. At any rate I have found but one form in the latter region.

***Merragata foveata* Drake.**

Ohio Jour. Sci., XVII:103, 1917.

MASS.—Sunderland, Mt. Toby, 28 May '21 (*Priscilla Butler*).

BELOSTOMATIDAE.

Lethocerus americanus (Leidy).MASS.—Northampton, 7 Oct. '19 (*H.M.P.*).

Covered with a bright green alga, which changed to gray in drying.

Lethocerus obscurus (Dufour).MASS.—Northampton, 26 Sept. '19 (*H.M.P.*).

OBITUARY.

F. W. L. SLADEN.

Canadian Entomologists were shocked to learn of the accidental death by drowning of Mr. F. W. L. Sladen, Dominion Apiarist, which occurred off Duck Island in Lake Ontario on September 10th, 1921.

For several years he had been conducting important experiments in the rearing of bees. On August last he left Ottawa for the above island, which is about 20 miles distant from Kingston, Ont. He had been in the habit of bathing in the shallow water close to the shore; unfortunately he could not swim. On the above date he went in bathing as usual and it is assumed that his heart, which had troubled him for several years, failed to function, thus causing his death. The body, which was recovered about seventy feet from the shore, was partially floating, unswollen, and no water was found in the lungs.

In the death of Mr. Sladen, entomology in Canada loses a very careful worker. Other than the reputation he had gained as a successful apiarist and student of bee rearing, he was well known in Canada, as also in the United States and England, as a close, systematic student of the aculeate hymenoptera. He had a wide knowledge of the wild bees, and his writings indicate a careful taxonomic acquaintance with the various characters of the groups he studied.

The collections he brought together not only indicate keen powers of observation, but also the intense pleasure he derived in gathering series of interesting species collected while afield in various parts of Canada, particularly in the West.

The late Mr. Sladen came to Canada in 1912 to join the staff of the old Division of Entomology, as Assistant Entomologist for Apiculture. When the Division of Entomology was separated from the Experimental Farms Branch in 1914 and raised to the status of a Branch of the Department of Agriculture, Mr. Sladen was retained by the Experimental Farms Branch as Apiarist. More recently his title was changed to Dominion Apiarist. Since 1914, however, he has always had a close connection with the Entomological Branch, having been, in fact, largely responsible for the identification and arrangement of the aculeate hymenoptera in the National Collection of Insects.

He was a Fellow of the Entomological Society of London, member of the Entomological Society of America, Entomological Society of Ontario, Ottawa Field-Naturalists' Club, etc.

As an author he was best known as the writer of "Queen Rearing in England" and "The Humble Bee," both excellent treatises. He was a frequent contributor of the Canadian Entomologist, Canadian Field Naturalist and other scientific journals. One of his most recent papers was the report he prepared on the Wasps and Bees collected by members of the Canadian Arctic Expedition of 1913-1918.

ARTHUR GIBSON.

Mailed February 3, 1922.

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POPULAR AND PRACTICAL ENTOMOLOGY

THE LIFE HISTORY OF A HOBBY HORSE

BY FRANCIS J. A. MORRIS.

Peterborough, Ont.

PART III.—SECOND CHILDHOOD—THE TREE'S INCLINE.

(Continued from Page 221)

So long as they held the middle space I had thought them a pair of ospreys, but presently, when they had already reached the greatest height I have ever seen these fish hawks flying at, one of the birds rose leisurely up in spiral upon spiral till it appeared little bigger than a skylark "at the last point of vision"; then down it shot in that fearful dive so closely past the outspread form of its floating mate that she seemed to rock where she slept; "she," for I am almost certain it was the male that made this supreme plunge from empyrean heights; the other, more passive, maintained the middle space, only now and then stooping, in turn, directly over him, or sweeping aslant with a downward glide to meet him in the common highway of the lesser fowls before he had fully recovered and soared once again into the unchallenged void of his eagle's realm. For nearly an hour from the little row-boat in which I was fishing I watched this royal pair at play.

At the end of August, there used to be a great routing out of guns, cleaning and oiling, ready for Black Duck; then came Wood-duck and Teal both the Blue- and the Green-winged, and later still Blue-bills, Saw-bills, Whistlers and several others. The only bird guide available in those days was McIlwraith's "Birds of Ontario," and I remember hours of puzzling one evening over a couple of strangers in the day's bag, that turned out to be two distinct species of Scoter, a surf duck from the Atlantic coast seldom seen in the neighborhood. And once my pupil returned from near the Mississippi Lake with a Cormorant that had fallen to some lucky gun.

These hunting trips were often the means of enriching our knowledge of Nature by curious observations. One day when my pupil and two others had carefully ensconced themselves in a lonely piece of swamp, each at a different station and in good time for the incoming ducks at sundown, they discovered to their surprise a fourth sportsman had anticipated their calculations and slipped into a "hide" in front of them. All three were watching the first black duck of the evening come whirring towards them, and not yet certain which of the three the duck would select to pass over, when suddenly a large hawk rose from ambush before their eyes, clutched the duck from below, and drew it down again out of sight in the drowned lands. The whole thing was done in a second and apparently with consummate ease; it looked as simple as the movements of a gymnast where the art of concealing art blinds one to all the nicety of adjustment, the hair's breadth balance of time and

space; only those who know the weight of a black duck and the terrific speed of its flight across a danger zone in mid-September, when plunging towards its nightly roost, can have the slightest idea of what this piece of falconry meant.

The tables were turned when one of these "duck hawks" suddenly seized a wooden decoy we had put out in a small bay and tried to drag it from its moorings. The savage anger of its blows with the beak and repeated clutchings of claw, made a deeper impression on us than they did on the perfidious piece of basswood itself; though this too showed plainly by dint and score where mandibles had glanced and talons slipped in their stroke.

I remember one day when my pupil and I went up the lake with a batch of decoys in search of wood duck and teal. On the way up I landed a couple of bass with a trolling rod, and then we drew our boats into cover of the reeds and entered the "hide". We hadn't been there many minutes when we heard a scrambling sound from my boat, and I was just in time to see a mink drop one of the bass over the gunwale and make off through the cat-tails on "safety first" principles. They are astonishingly bold and will steal bait from a minnow pail almost under one's nose. While waiting patiently in the hide, we heard the whistling of wings as from an approaching flock of wood duck. But nothing appeared and the sound lasted on and on without perceptibly waxing or waning; I could make nothing of it; it might have been a phantom flock tethered in a nightmare, beating the air but making no progress. My companion's ears were better trained than mine and he soon solved the riddle; a vast phalanx of wild geese strung across the sky on their southward march, with leaders and outriders all in order; they appeared almost as specks so high were they flying, yet the sound was plainly audible for many minutes.

In 1899, the year before I settled in Port Hope, it was my good fortune to spend spring and early summer in Toronto. My best finds were botanical, and the only bird record I made was very early in May towards the west of High Park. I had just discovered a great colony of Skunk Cabbage in a small willow swamp, when almost over my head I heard some full sweet tones of bird music; they came from a nearby poplar just leafing out, and by tip-toeing cautiously up I was able to spy the singer and watch him through his song. As soon as I described the bird to Dr. Brodie he proclaimed it the Rose-breasted Grosbeak. I had never seen or heard of it before, and though I often saw it afterwards at Port Hope, I never heard it in full song until I came to Peterborough; now, whenever I hear it, I am carried back in spirit to High Park and the revelation of twenty years ago. The plant treasures were far more numerous, and so interesting as to fill the whole season with delightful surprises; east of the city I discovered the little Rue Anemone, which Dr. Brodie assured me he had never found except west of Toronto; up north I found the handsome Orange Lily and the nodding heads of the Woodlily; the Turk's Cap, also, I found at Scarborough Heights; in Rosedale, too, I first found the "wooden enemies" of my Scottish home (*Anemone nemorosa*), the most delicate and charming of all their kind—the true "wind-flower;" to the west I found the lovely blue Lupine, the Orange Milkweed, the Beard-tongue, the Feverwort and the Painted Cup. By the following April I had settled in Port Hope.

That Natural History takes firmer hold in a community of boys than anywhere else, was amply borne out at my new home of Trinity College School. For years its Head Master had been Dr. Bethune, an entomologist of continental reputation. Though athletics held a high place of esteem, there was always an awkward squad of a minority poor at games and forming a kind of Stalkey & Co. in the school. Such boys have often a natural trend in the direction of birds' nesting; and there had always been a good deal of surreptitious egg-collecting done by the pupils; this was "taboo" among the masters, and in order to make the ban effective, some wise-head of earlier days had instituted an annual prize for wild flowers; a rule of the competition was that each collection of plants must be the work of two boys in partnership. This incentive of a prize largely explains why there were usually at least four or five pairs of partners working quite enthusiastically through the summer term at their collecting, mounting, and naming of specimens. Almost as soon as I joined the staff my room became the resort of the plant collectors, and when they organized into a Field Club, they asked me to be their Honorary President.

My first two seasons were spent in active pursuit of Botany and Ornithology. I had cleared the way, I thought, enough to run both hobbies concurrently. It was now that I began to fill two shelves with books on Natural History, one devoted to plants and the other to birds, the nucleus of a whole case now numbering some 400 volumes. I never felt quite the same need of books, for purposes of identification, in Botany as in Birds. When I came to the school first I had nothing on Ornithology but a copy of McIlwraith; besides that, I knew of a periodic publication called "Birds", afterwards "Birds and All Nature". But almost coincident with my settling in Port Hope there began to appear a number of popular books, with colored illustrations, on various branches of Natural History. The pictures were nearly all photographic by the three-colour process. My first purchase was Chapman's Bird Life and this was followed by the volumes of Neltje Blanchan on "Bird Neighbors" and "Birds that Hunt and are Hunted", Dugmore's "Bird Homes", Chester Reed's "Color Key to North American Birds" and "Key to the North American Birds' Eggs;" more recently still were added the invaluable little pocket books of bird pictures, description and classification; besides these I purchased (on a hint from one of John Burroughs' essays) a pair of field glasses, and always carried notebook and pencil to the woods with me; in this way I formed the habit of complex observations, attempting to jot down the syllables of a bird's song or to describe it in words, to watch its coloring in different parts, wings, tail, body, head, throat and breast, its perch and manner of flight, and generally its habits; my first volumes on Birds were too large to carry to the woods, but on returning to my study I always made a bee line for the book shelf. At first my trips were primarily botanical and only included bird notes on the side. But I made a number of most interesting observations, and in my almost daily excursions saw a great many out of the way birds and bird homes. I never took an egg, even the rarest, and never (I am happy to add) had the slightest desire to.

While busy with bird observations, I found it a great pleasure to note the birds seen in the winter and the early spring arrivals till the flights of warblers. Among the birds that I saw occasionally all winter were robins; these appeared

to go into winter quarters in thickets of cedar about the golf links, and in mild Decembers and Januaries I have often seen them hopping about in the open; two mild years I saw Kingfishers on the running water below Corbett's pond and noted them every month from October to April; one more proof that it is want of food, not cold, that drives them south; I have also seen Meadow Larks in December. Among regular winter residents (besides Chickadees and Wrens) were noted Snow-birds, Horned Larks, Siskins, Goldfinches, Purple Finches, Red-polls, Wax-wings, Pine Grosbeaks and the Evening Grosbeak. In spring, favorites were the Ruby- and Golden-Crowned Kinglets, the American Redstart, the Black and White Warbler, the Blackburnian, the Chestnut-sided, the Bay-breasted, the Canadian and the Black-throated Blue Warblers.

A season or two's rambling about the neighborhood soon led to the selection of some five favorite haunts for my leisure hours:—Monkey Mountain on the outskirts of the town; Choate's Wood, the North Wood and "The Rocky Mountains", all three in line for a single round trip; and last the Newtonville swamp about ten miles west. At Monkey Mountain I discovered a favorite haunt of the Brown Thrasher, and spent hours listening to its masterful music. It was here, too, that I first discovered (to my surprise) the double personality of the Chickadee; the bird I was watching at its trapeze work suddenly passing from the familiar scolding prattle to a soft deliciously sweet and plaintive "Tee-hee"; different from the Phoebe's cry, which is not nearly so musical nor plaintive at all. The most attractive of all the Flycatcher calls in my experience is the Olive-sided Flycatcher's "Whip-whee-eu", loud, clear, and commanding, but no way harsh (the common fault of the Flycatchers); next to it I place the Crested Flycatcher's, more imperious and slightly harsh, but not to the point of disagreeable. The Crested Flycatcher is quite common about Port Hope and once I had a curious experience. I was working in my room about supper time when there came to my door a shuffling of feet and then a hesitating knock. In came two boys who explained that they wanted to show me something, if I would promise not to forfeit it; they had been bird's nesting and had found a strange egg in a nest built over an old Highholder's in a hollow apple tree. Reference to Chester Reed's book soon brought the discovery that it was a Crested Flycatcher's. Knowing the peculiar instinct of this bird to weave a snake's skin into its building material I asked the boys if they had noticed anything peculiar about the nest. They hadn't, but would go and look carefully over it next day; on their coming to report I was to tell them the name of the egg. In they came, full of excitement, with what, do you suppose, in their hands? Not the slough of a snake, but a mighty good substitute they had found in the material of the nest—five or six crumpled pieces of oil-paper candy-wrappers! John Burroughs records having seen onion-peel and the scales of shadfish in their nests where the birds had failed to find snake skins. It seems possible, too, that the Flycatcher does his own fishing for shad; not long ago a Flycatcher was seen, by a good observer, to play the Kingfisher and pick a live shad out of the water, on the shore of Lake Ontario. This curious habit of the Crested Flycatcher is apparently inherited from tropical ancestors and is shared with it (so I have read) by one of the common Flycatchers of Brazil.

The whole course of my round from Choate's to the North Wood and "The Rockies" was soon dotted with discoveries. Near Mitchell's Gardens I

saw my first Orchard Oriole; and a few rods further on, the larder of a Northern Shrike; the bird was fluttering at the top of a barb wire fence and on my approach flew heavily away with what looked like a sparrow; on examining the fence I found the two top strands of wire, all the way along between two posts, had been used for killing and hanging the butcher's meat, the barbs having remains of beetles, birds and mice smeared about them.

(To be Continued.)

ON SOME ARACHNIDS FROM SOUTHERN UTAH

BY RALPH V. CHAMBERLIN,

Cambridge, Mass.

In a small collection of spiders and scorpions from St. George, Utah, sent me for identification, are representatives of two new species which are here described. The other species in the lot are also listed. The material was collected by Mr. V. L. Tanner.

ARANEINA.

Dictyna volucripes Keyserling.

One female of this widespread species, which is common in central and northern Utah.

Psilochorus utahensis Chamberlin.

One female apparently this species, which is common in Millard Co., from where described.

Physocyclus tanneri, sp. nov.

Female.—As compared with *P. globosus* Tacz. this is a larger species with much longer and stouter legs. It may at once be distinguished by lacking the caudal process at caudal end of cephalothorax and the opposing chitinous spot on abdomen which are characteristic of *globosus*. The abdomen is obviously less elevated and more flattened above, and in front protrudes farther over the cephalothorax; its anterior end somewhat bigibbous (cf. fig. 1.) The epigynum has the anterior processes larger as compared with the posterior portion and much more widely separated, posterior portion less protuberant; the fold just back of genital furrow stronger, on a level with contiguous part of epigynum, dark and chitinous. The epigynum more resembling that of *P. cornutus* of Lower California. Cf. Plate X, figs. 2, 3, 4 and 5.

Length 4.5 mm.; length of leg, 1.33 mm.

Two females.

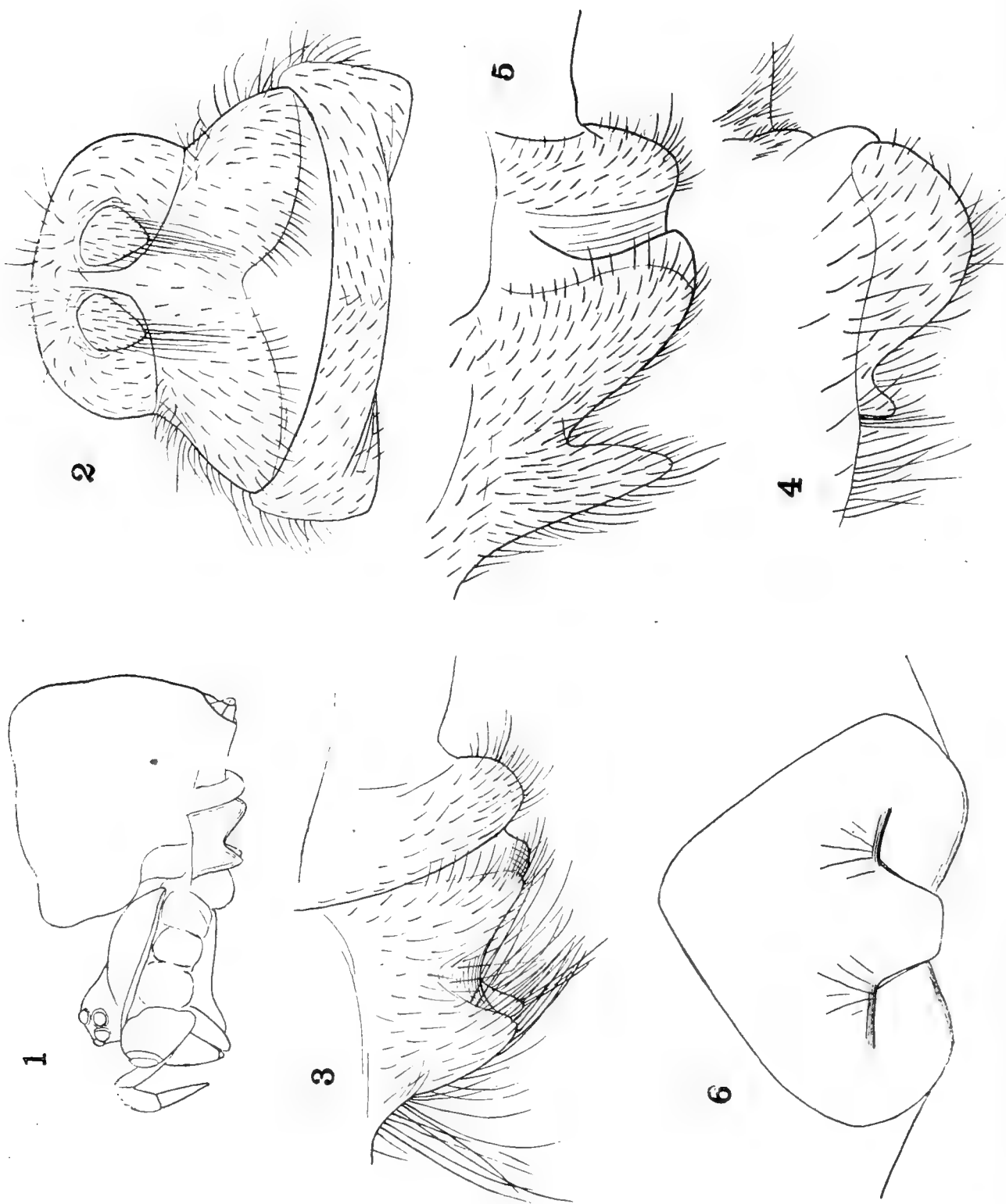
Philodromus virescens Thorell.

Philodromus clarus Keyserling, Die Spinnen Amerika, 1880, I, p. 214.

One male of this form, which is common farther north on sage-brush.

Philodromus utus, sp. nov.

In alcohol the carapace is greyish fulvous, with a lighter greyish median longitudinal stripe more or less evident. Legs colored similarly to carapace. Abdomen grey, without distinct markings. Venter pale. Posterior median eyes a little more than twice their diameter apart, about half as far from the laterals, or a little more. Anterior lateral eyes nearer to the posterior medians than to the posterior laterals. Tibiae I and II with three pairs of long, overlapping spines beneath. Spines of metatarsi I and II similarly three pairs be-



ARACHNIDS FROM S. UTAH.

(See Page 247)

neath and overlapping. Abdomen depressed, somewhat bigibbous in front. Characterized more particularly by the form of the epigynum. (cf. Plate X, fig. 6.).

Length, 5 mm.

Several females.

Tibellus duttonii Hentz.

One female apparently this species.

Olios fasciculatus Simon.

Two females.

Pardosa sternalis Thorell.

Several females and males. This is one of the commonest spiders found in the intermountain region.

Lycosa apicata Banks.

One male. The species has not previously been taken in the region.

Oxyopes salticus Hentz.

One female.

Phidippus workmanii Peckham.

Three females.

Phidippus formosus Peckham.

One female.

Salticus albocinctus Peckham.

A male and female. Previously known from Arizona and Mexico.

Eurypelma steindachneri (Ausserer).

One female.

SCORPIONIDA.

Hadrurus hirsutus (Wood).

One specimen of this large form.

Velovis mexicanus (Koch).

One specimen.

EXPLANATION OF PLATE X.

Fig. 1.—*Physocyclus tanneri*, sp. n., lateral view of body. x 10. 2.—The same, epigynum, ventral view. x 33. 3.—The same, ectal view of epigynum. x 33. 4.—*Physocyclus globosus* Tacz., epigynum, ectal view. x 33. 5.—*Physocyclus cornutus* Bks., epigynum, ectal view. x 33. 6.—*Philodromus utus*, sp. n., epigynum, ventral view. x 38.

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID
GENUS *ERNESTIA* R. D. (DIPTERA)

BY DR. JOHN D. TOTHILL

In Charge of Natural Control Investigations, Entomological Branch, Ottawa.

(Continued from Page 230)

Ernestia nigropalpis sp. n.

Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground with black hairs coming nearly up to the

eyes and with a row of stouter hairs at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment and equal to about one-third the distance between the vibrissae. Facial ridges bristly on lowest fifth. Facial depression silvery pollinose, without any carina. Antenna in male reaching lowest three-fourths of the face, all three segments black; third segment in male almost twice as long as the second. Arista thickened on basal two-fifths; the penultimate segment no longer than broad; width of front in male at narrowest point measuring slightly less than the length of the second antennal segment, silvery pollinose becoming black at vertex; frontal vitta dull, dark-brown, at narrowest point slightly wider than either side of front. No orbital bristles in male; the frontal bristles extending to base of third antennal segment. Ocellar bristles present in male, directed forward.

Thorax subshining, black, covered with grey pollen; scutellum grey pollinose on a black ground tinged faintly reddish at apex. Three sternopleural bristles and three to four post suturals; scutellum with three marginal pairs of machrochaetae and a terminal cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of three to five bristles at the base on both the upper and lower surface. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal bristles present on the second, third and fourth abdominal segments; a pair of median marginal machrochaetae also present on each of these segments. The fifth tergum very narrow and rather indistinctly marked off by a suture from the sixth tergum with which it is united. Sixth abdominal segment almost as long as the fourth and forming a conspicuous genital segment.

The black genitalia of the male are characterized by there being a short median keel situated on the basal part of the inner forceps (valvae internae), and by the fact that this keel is not concave in profile on either of its two margins.

The horseshoe-like indenture of the fifth sternite extends rather less than half way into the sternite.

Described from eleven males taken at Franconia N.H., Stickeen River, B. C. (type locality), and Savary Island, B. C., by Messrs. C. H. T. Townsend, Wickham and R. S. Sherman.

Type in the Canadian National Collection, Ottawa. The paratype, No. 24354, from Franconia in the U. S. N. M., Washington, D.C.

***Ernestia arcuata* sp. n.**

Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi usually yellow at the tip and infuscated basally, occasionally black. Eyes hairy, cheeks (below the eyes) white pollinose on a black ground, subshining on the lower part that is covered with black hairs, a row of stouter hairs at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width in male slightly less than the length of

the second antennal segment and equal to about two-fifths the distance between the vibrissae. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose, without any carina. Antennae in male reaching the lowest fourth of the face, all three segments black; third segment in male about one and one-half times as long as the second. Arista thickened on basal two-fifths to one-half, the penultimate segment scarcely longer than broad. Width of front in male at narrowest point measuring slightly less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark brown, at narrowest point—in male—slightly wider than either side of front just cephalad of the ocellar triangle. No orbital bristles in male, the proclinate ocellars somewhat weak and reduced in cases to mere hairs; the single row of frontal bristles decending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground in most specimens tinged reddish, especially at the apex. Typically three sternopleural bristles but considerable variation noticeable in the type material; typically four dorsocentral bristles, but these likewise vary considerably in the type material; scutellum with three marginal pairs of machrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3} . Tegulae white.

Abdomen subshining; silvery pollinose on a black ground that occasionally becomes reddish, particularly on the lateral parts of the first three segments. Discal machrochaetae present on the second, third and fourth abdominal segments; median marginals present on the same segments. The hind margin of the third tergum strongly arcuate. The fifth tergum distinctly marked off by a suture from the sixth or first genital segment and laterally being a third as long as the lateral part of the fourth abdominal segment. The sixth and seventh abdominal segments forming somewhat distended genital segments.

Male genitalia black. The basal part of the outer forceps is expanded into a broad, leaf-like portion. The basal part of the inner forceps is equipped with a short median, keel-like projection, the basal edge of which is concave in profile.

The horseshoe-like indenture extends rather more than half way to the base of the fifth sternite.

Described from ten males taken at Great Falls, Va., (type locality), Mount Vernon, Va., Cabin John Bridge, Maryland, Bladensburg, Md., Plummers Island, Md., Hartford, Conn., Malden, Mass., and North Saugus, Mass. Material collected in April and May.

Type No. 24355 in the U. S. N. M., Washington, D.C. A paratype in the National Collection at Ottawa.

***Ernestia incisa* sp. n.**

Description of male. Head at vibrissae nearly as thick as at base of antennae, vibrissae far above the oral margin. Palpi in the single type speci-

men black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower part that is covered with black hairs, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to the base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width equal to the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments black; third segment about one and one-half times as long as the second. Arista thickened on basal two-fifths, the penultimate section scarcely longer than broad. Width of front at narrowest point measuring slightly greater than the length of the second antennal segment, the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point slightly wider than either side of front just cephalad of the ocellar triangle. No orbital bristles, the ocellars proclinate; the single row of frontal bristles extending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that is very slightly reddened at the apex. Three sternopleural bristles and four pairs of dorso-centrals. Scutellum with three pairs of marginal macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle; the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of five to ten hairs both above and below at the junction with R_{2+3} . Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and median marginal macrochaetae on segments two, three and four. The hind margin of the third tergum slightly arcuate. The fifth tergum which is pollinose, clearly marked off from the sixth which is shining; the fifth tergum is at its greatest length about one-fifth the length of the lateral part of the fourth. The sixth and seventh abdominal segments form the somewhat distended genital segments.

Male genitalia black. The basal part of the outer forceps is expanded into a broad, leaf-like portion. The basal part of the inner forceps is equipped with a short median, keel-like projection, the basal edge of which is very slightly concave in profile.

The horseshoe-like indenture extends a little less than half way to the base of the fifth sternite. The outer edges of the prongs are deeply incised, thus affording a character that serves to separate the species from any other North American species.

Described from a single male taken at Carlisle Junction, Pa., by W. R. Walton.

Type No. 24356 in the U. S. National Museum, Washington, D. C.

***Ernestia aldrichi* Town.**

Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi dusky yellow to almost black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on

the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height; sides of face covered with silvery pollen; bare; narrowest width not quite equal to the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of face, all three segments black; third segment about one and one-fourth times as long as the second. Arista thickened on basal two-fifths to one-half, the penultimate segment slightly longer than broad. Width of front in both sexes about twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point one and one-half to twice as wide as either side of front just cephalad of the ocellar triangle. One pair of orbital bristles in the male, two pairs in the female. Ocellar bristles present in both sexes and proclinate, the single row of frontal bristles descending almost to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground. Typically three sternopleural and four dorsocentral macrochaetae but both sets are quite variable; scutellum usually with three pairs of marginal and one pair of cruciate apical bristles. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3} . Bend of M_{1+2} with a very short appendage in a few of the males, otherwise destitute of an appendage. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third tergite somewhat arcuate in the male. The fifth tergum in the male marked off from the shining sixth by a suture, longer laterally than medially, laterally about one-fifth the length of the lateral part of the fourth tergum. The sixth and seventh abdominal segments in the male forming the somewhat prominent genital segments.

Genital segments of the male black. The basal part of the outer forceps covered by a leaflike expansion. The basal part of the inner forceps with a long median, keel-like projection.

The indenture in the last sternite of the male extending half the distance toward the base of the sternite.

Redescribed from the type material consisting of three males and four females, from Brookings, S. D., in the U. S. N. M., Washington, D. C. One paratype transferred by courtesy of the collector, Dr. J. M. Aldrich, to the Canadian National Collection, Ottawa.

***Ernestia longicarina* sp. n.**

Description of male. Head at vibrissae almost as thick as at base of antennae; vibrissae far above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) pale golden pollinose on a black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from oral margin to base of eye equal to about one-third the eye height. Sides of face pale golden pollinose; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial

depression pale golden pollinose without any carina. Antennae reaching lowest fourth of face, all three segments black; the third segment about one and one-fourth times as long as the second. Arista thickened on basal half, the penultimate segment scarcely longer than broad. Width of front at narrowest point equal to about three-fourths the length of the second antennal segment; the front silvery pollinose; frontal vitta reddish brown, the narrowest width equal to about one-half the width of front at vertex. No orbital bristles, the proclinate ocellar bristles fairly well developed; the single row of frontal bristles descending to about the middle of the second antennal segment.

Thorax subshining, black, covered with gray pollen, scutellum gray pollinose on a black ground and showing no red coloration even at the extreme tip. Typically three sternopleural bristles and three pairs of dorsocentrals; scutellum with three strong pairs of marginal macrochaetae, with an apical cruciate weaker pair and without any discals. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3} ; the bend of M_{1+2} destitute of an appendage. Tegulae white.

Abdomen subshining; very lightly silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third tergum very strongly arcuate; the fifth tergum readily marked off from the sixth at the lateral part but medially indistinguishable from it. The lateral width of the fifth tergum equal to about one-third the lateral width of the fourth abdominal segment; the sixth and seventh abdominal segments forming the somewhat distended genital segments.

Genitalia black; differing from all other known nearctic species in having an exceedingly long keel-like portion at the base of the inner forceps (named on account of this unusually long keel). The basal part of the outer forceps covered over by a broad, leaf-like portion.

The horseshoe-shaped indenture of the last sternite extending slightly more than half the distance to the base of the blade.

Described from four males collected by Mr. E. C. Van Dyke at Lake Tahoe, California on September 20th.

Type and one paratype in the Cal. Acad. Sci. One paratype in the Canadian National Collection, Ottawa. One paratype in the U. S. N. M.

(To be Continued.)

A REVIEW OF THE GENUS MONOCHAMUS SERV. (CERAMBYCIDAE, COLEOPTERA)

BY RALPH HOPPING,

Entomological Branch, Department of Agriculture, Ottawa.

A study of long series of the different species of this genus has made it evident that a few changes in the synonymy are necessary. The writer's interpretation of the North American species is expressed in the accompanying key.

Leng and Hamilton* place *obtusus* Casey and *oregonensis* Lec. as synonyms of *scutellatus*; but all three of them appear to be distinct. Col. Casey has transferred *oregonensis*** Lec. to the dentiform group, but the writer feels he must have mistaken a black form of *maculosus* for that species: this would account for the description of *monticola* Casey, which appears to be the true *oregonensis* Lec.

The most strongly maculated species are *titillator*, *maculosus*, *obtusus* and *marmorator*. *M. maculosus* may be densely black or reddish brown, although the red-brown individuals are probably newly emerged.

The length of the antennae varies greatly within the limits of each species and appears to the writer to be of little specific importance. The sexes, however, can be separated by antennal characters, since the females of all species have the antennae but little longer than the body, often with the segments bicolored, while the males have the antennae much longer than the body and the segments as a rule unicolorous.

The size varies greatly in each species apparently according to the condition of the food supply. Individuals are generally smaller in arid sections where the recently fallen or cut timber dries rapidly.

The key to the species herein submitted is based upon an examination of the material in the Oregon Agricultural College, very kindly loaned by Professor Lovett, the material in the collection of the California Academy of Sciences, that in the private collection of Dr. F. E. Blaisdell and Dr. E. C. Van Dyke, the Ottawa collection of the Entomological Branch and that of the author.

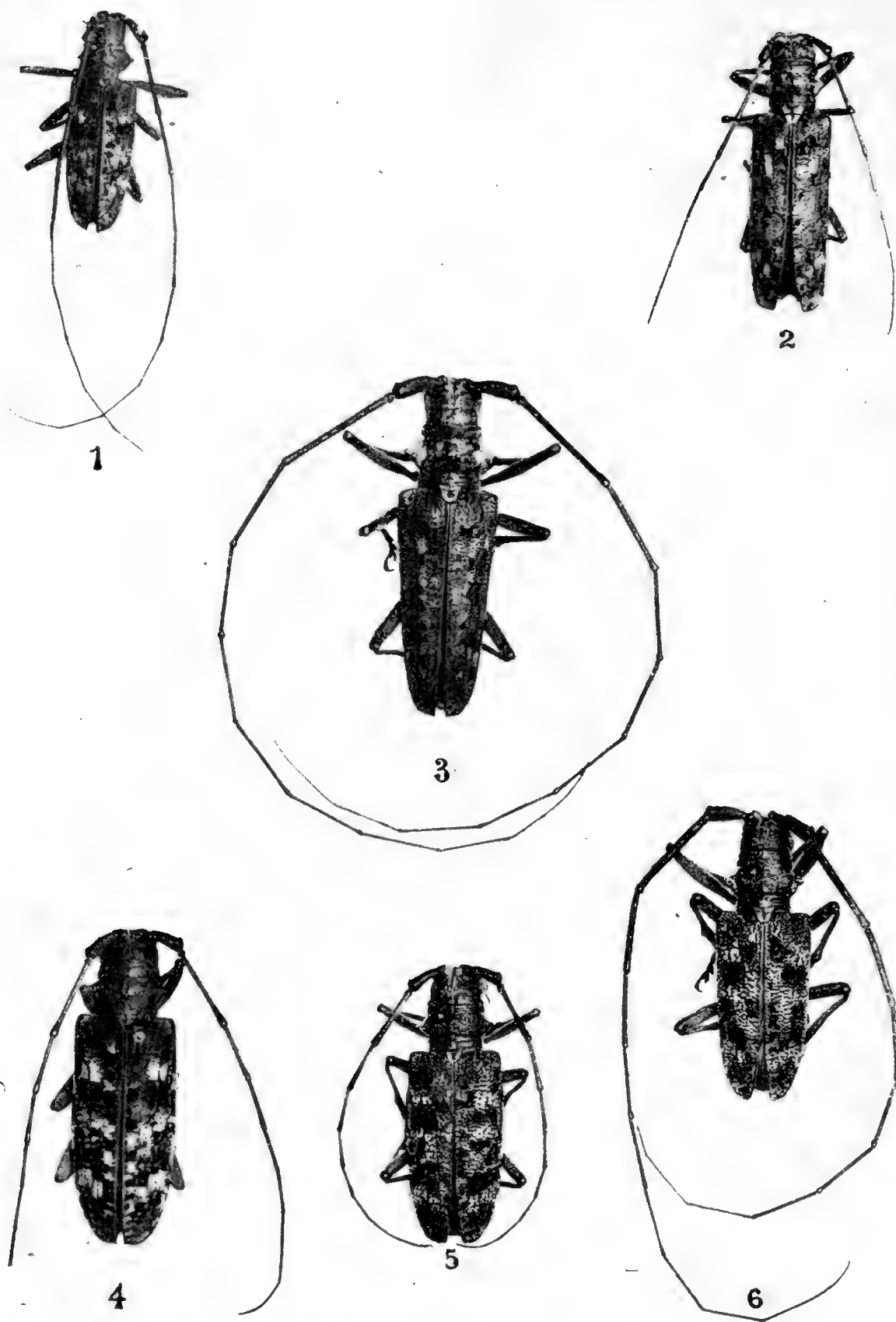
M. angusticollis is known only from the description. Of the species included in the table the writer has examined the following number of adults:—12 *marmorator*, 17 *obtusus*, 85 *maculosus*, 50 *titillator*, 102 *oregonensis*, more than 200 *notatus* and over 500 *scutellatus*.

KEY TO SPECIES.

- A. Apices of elytra produced into an acute spine or blunt process.
 - B. Process of elytral apex arising from sutural angle.
 - C. Process of elytral apex slender, acute or subacute; body and antennae comparatively slender; punctation of elytra sparse and fine, ashy vestiture in more or less definite areas; general color reddish *titillator* Fab.
 - CC. Process of elytral apex blunt; body comparatively short and robust; punctation of elytra dense and coarse, ashy vestiture more or less diffused; general color black or rufous *maculosus* Hald.
 - BB. Process of elytral apex not arising from sutural angle.
 - C. Process of elytral apex arising from the rounded apices, spinous
angusticollis Casey
 - CC. Process of elytral apex arising from the obliquely prolonged apices; vestiture of elytra often in definite patches; general color yellowish brown *marmorator* Kirby

*Transactions Am. Ent. Soc., 1896, XXIII, p. 109.

**Memoirs on the Coleoptera, IV, 1913.



THE GENUS MONOCHAMUS

Fig. 1.—*M. titillator*, ♂ ; 2.—*M. notatus* ♀ ; 3.—*M. notatus*, ♂ ; 4.—*M. titillator*, ♀ ;
5.—*M. maculosus*, ♀ ; 6.—*M. maculosus* ♂ . (All figures enlarged one-half.)

AA. Apices of elytra not produced into a spine or process.

B. Elytral apex obtusely angulated at the suture.

C. Elytra without raised linear elevations.

D. Scutellum generally covered with ashy scales, posterior margin rounded; elytra with a vague bronze lustre, maculation often entirely absent; general color black *scutellatus* Say

DD. Scutellum bilobed or V-shaped with only the lobes covered with ashy scales and separated by a minute triangular glabrous area; maculation of elytra absent or sparse; general color densely black.

oregonensis Lec.

CC. Elytra with raised linear elevations.

Scutellum sparsely clothed except towards the margins; elytra densely, finely punctured with scattered, raised, often linear, glabrous areas; general color greyish brown *notatus* Drury

BB. Elytral apex not angulated at the suture, evenly rounded; punctation sparse and fine, scutellum glabrous and rufous; general color rufous.

obtusus Casey

M. titillator Fab. (Lamia), 1775, Syst. Ent. p. 279.

carolinensis Oliv.; *minor* Lec.; *dentator* Fab.

Col. Casey has resurrected *carolinensis* Oliv. from the synonymy of this species. Leng and others treat the name as a synonym. In long series every variation in size, maculation and reduction of the spine into a blunt form may be found.

I have a specimen of *titillator* from the southern Sierras of California, which I collected over twenty-five years ago. I have, however, a strong suspicion that my California specimen came from lumber shipped from the east. Former reports of the capture of this species from California probably refer to *M. obtusus* Casey.

The slender antennae and the sparse punctation in the cinereous areas will always serve to separate this species from *maculosus*, besides the differences enumerated in the key; the vestiture consists of light brown or yellowish tomentose areas separated by cinereous areas, sparsely punctured. Specimens from the far north have only indications of the ashy areas, and seem narrower in form; however, I cannot separate them from *titillator* by any definite characters. Length, 13 to 25 mm.

Host.—*Pinus palustris*, *P. strobus* and probably all pines and *Abies balsamea*.

Habitat.—Eastern North America, extending west to Alabama in the south and possibly to British Columbia and Alaska.

M. maculosus Hald., 1874, Trans. Am. Phil. Soc., X, p. 51.

strenuus Casey; *oregonensis* Lec. (Casey); *clamator* Lec.

Col. Casey's interpretation of *M. oregonensis* Lec. as well as his *strenuus* seem to belong here. Occasional specimens of *maculosus* in a series from the same tree show all variations of "rusty brown tomentum". The length of the antennae is very variable in all species and series. The rugosities of the elytra are irregular in form, the vestiture consisting of dark brown, rusty brown or

black tomentum separated by cinereous areas of scales arranged in minute separated groups. Length, 16 to 26 mm.

Hosts.—Breeds more commonly in lodgepole pine (*Pinus contorta*) than in yellow pine (*Pinus ponderosa*).

Habitat.—Colorado, New Mexico, Arizona, California, Oregon, Washington, Nevada, Idaho and British Columbia.

M. angusticollis Casey, 1913, Mem. on the Coleop. IV, p. 292.

I have not seen this species nor can I find that it exists in any collection other than that of Col. Casey, which, since it comes from Texas, is not strange. Material from that state, in the Cerambycidae, seems to be notably absent in collections. The position of the apical spine would separate it from any other species. Length, 18.5 mm.

Host.—Unknown.

Habitat.—Texas.

M. marmorator Kirby, 1837, Faun. Bor. Am. IV, p. 169.

fautor Lec.; *acutus* Lacord.

The characters given in the key are amply sufficient to distinguish this species, which is still rare in collections. The vestiture of the elytra is ochraceous white and brown or black in more or less definite patches. Length, 18 to 25 mm.

Host.—*Abies balsamea*.

Habitat.—New York, Vermont, Nova Scotia to Great Lakes Region.

M. scutellatus Say, (Cerambyx), 1824, Long's Exp. II, p. 289.

resutor Kirby; *mutator* Lec.

I have this species from Alaska, Hudson's Bay, Michigan, Ontario and Massachusetts, and have seen specimens from all the spruce regions of Canada. The vestiture is either wanting or consisting of a few ashy, irregularly placed scales. Some females, however, are fairly well covered with ashy vestiture of no particular design.

Alaskan specimens generally have the femora red but do not seem to differ otherwise. The antennae, especially the scape, seem to be brownish and seldom black as in *M. oregonensis*, and have the elytra vaguely bronzed. The ♀♀ are generally smaller than the ♂♂. Length, 13 to 24 mm.

Hosts.—*Pinus strobus*, *P. banksiana*, *P. resinosa*, *Picea canadensis*, and *Abies balsamea*.

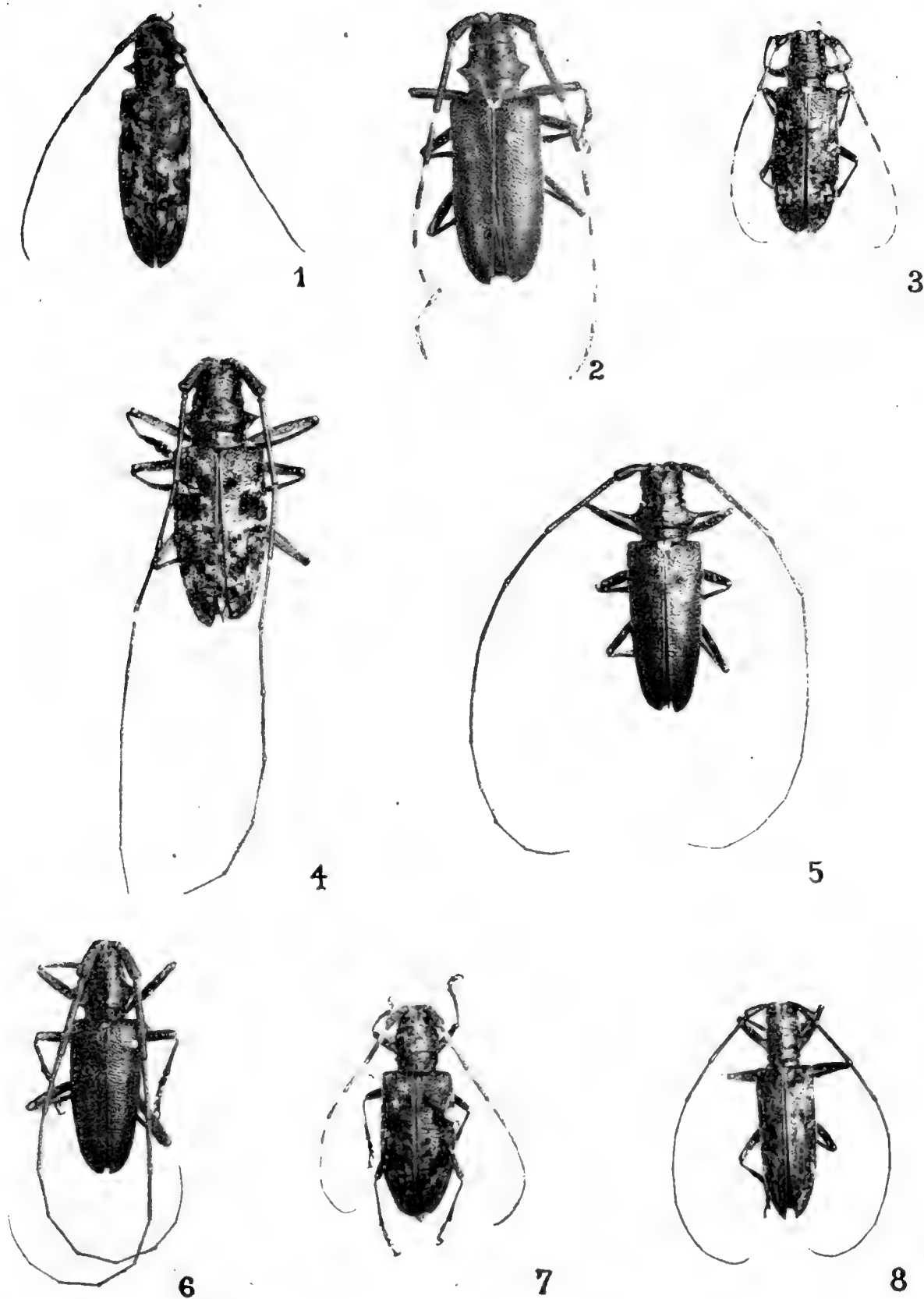
Habitat.—New England, Canada (except British Columbia), Alaska.

M. oregonensis Lec., 1873, Smiths. Misc. Coll., XI, No. 264, p. 231.

monticola Casey.

Mr. Lawrence Reynolds very kindly examined Le Conte's type for me. It was found to agree with what has always been called *oregonensis* in the west. The large stout form, dense black color, and the scutellum distinguish this species. The vestiture is much as in *scutellatus*. The ♀♀ are as large as or larger than the ♂♂. *M. oregonensis* is distributed throughout the west where *Pseudotsuga taxifolia* and *Abies concolor* are found, although it attacks other coniferous species within the area. Length, 13 to 30 mm.

Hosts.—*Abies concolor*, *Abies magnifica*, *Pseudotsuga taxifolia*, *Pinus*



THE GENUS MONOCHAMUS

Fig. 1.—*M. marmorator*, ♀; 2.—*M. oregonensis*, ♀; 3.—*M. scutellatus*, ♀; 4.—*M. obtusus*, ♂; 5.—*M. scutellatus*, ♂; 6.—*M. oregonensis*, ♀; 7.—*M. obtusus*, ♀; 8.—*M. marmorator*, ♂.

contorta. Specimens from *Pinus contorta* are usually smaller, with the elytra of the males more densely maculate.

Habitat.—British Columbia, Washington, Oregon, California, Nevada, Utah, Colorado, Arizona, New Mexico.

M. notatus Drury, 1773, Ills. of Nat. Hist. II, p. 65.

**confusor* Kirby.

This species can be readily distinguished by the smoky grey color. Occasionally the glabrous rugosities become obsolete, or may be rounded. It averages larger than any other species and is a good illustration of the tremendous variation in size, the minimum being .50 inch and the maximum 1.50 inch, an extreme variation of one inch. Length, 16 to 40 mm.

Hosts.—*Pinus strobus*, *P. banksiana*, *P. resinosa*, *P. ponderosa*, *Picea canadensis*.

Habitat.—Northeastern part of the U.S. and Canada, including British Columbia.

M. obtusus Casey, 1913, Mem. on the Coleop. IV, p. 293.

This is a very good species, breeding in pines of north central California, where the cross ranges connect the coast mountains with those of the interior. In maculation and punctation it is much nearer *titillator* than any other species, but has a remarkably short, robust form. The sutural length of the elytra is seldom more than twice the basal width, whereas in all other species it is much more than twice the basal width. The characters given in the key and enumerated by Col. Casey make it impossible to confuse this species with any other. Besides the specimens in my cabinet, I have seen a much larger series in the collection of the Academy of Sciences in San Francisco taken by Dr. E. P. Van Duzee. Length 19 to 23 mm.

Hosts.—*Pinus ponderosa*, *P. contorta*.

Habitat.—California (Lassen and Siskiyou Cos.)

A NEW WESTERN SYRPHID (DIPTERA).

BY C. HOWARD CURRAN,
Orillia, Ont.

Toxomerus occidentalis n. sp.

Mesogramma geminata Williston (in part).

Differs from *T. geminatus* Say in the shape of the process on the hind femora, which is shorter and bears a shorter and stouter arm; the front is wider in the female, the vertical triangle slightly wider in the male; band on first segment always interrupted in both sexes.

Length, 6.5 to 8 mm. ♂. Face yellow, below and at the sides finely silvery pubescent; cheeks black behind. Antennae reddish yellow, arista black; vertical triangle long, narrow, black, in front and at the vertex with yellowish pollen, in the middle very shining; eyes less distinctly touching than in *T. geminatus*, especially dorsally. Pile of the front whitish, a few blackish hairs immediately above the antennae, and entirely black on the vertical triangle.

*It is a little doubtful if Drury's species *notatus*, from Norway is our *confusor* and the latter name may have to be re-established.

Posterior orbits greyish pollinose, becoming more yellowish above.

Thorax shining greenish, somewhat bronzed black, with three broad, subcontiguous opaque brownish bronzed stripes; median cinereous line distinct on the anterior half. Yellow lateral margins complete. Pleurae bluish black, the mesopleura with oblong-oval yellow spot, and a white pubescent spot below it. Scutellum shining olivaceous black with yellow border. Pile of thorax and scutellum obscurely yellowish, the latter with a fringe of long black hairs; pleurae with sparse whitish pile.

Abdomen deep shining black; first segment with only the antero-sides or with a very narrow anterior border yellow. Second segment with a narrow median, slightly arcuate or straight, interrupted yellow band, the lateral margins in front of this narrowly yellow; or with the band almost obsolete and the margins black. Third segment with a median longitudinal yellowish line abbreviated at both ends, the black in front forming more or less of a circle; at each side with a basal, broad yellow band, with an oval production posteriorly at the inner end. Fourth segment with five yellow spots, the median one similar to the median line on the third segment; two elongate broad, longitudinal spots, their posterior ends rounded, situated each side of the median spot, and two sub-square spots, longer laterally, on the anterior angles. Fifth segment with the sides yellow, more narrowly so posteriorly. Apical margins of second to fifth segments yellow or reddish. In darker specimens the median lines are almost obsolete and the spots all smaller, those on the posterior angles of the fourth segment triangular and the apex of the fifth segment black. The spots on the third segment occupy not more than the anterior half of the segment where they are longest. (In *geminatus* they always occupy considerably more than half, even in very dark specimens.)

Legs yellow, including the hind coxae; posterior femora black, except the ends; tibiae with a black band near the end; hind tarsi brown, anterior tarsi reddish apically; the hind femora sometimes with only a black band sub-apically in the female. In the male the hind tibiae broadly produced at the apical end, and arcuate; hind femora strongly arcuate, the process near the base stouter and with shorter arm projecting posteriorly than in *geminatus*.

Wings hyaline, stigma yellowish brown.

♀. Antennae with the third joint broadly brownish above; face distinctly white pilose below; front shining black, black pilose; not as much narrowed above as in *geminatus* and the yellow on the sides also seems to be slightly narrower; abdomen, second pair of basal spots moderately broad, a little broader medially and laterally, interrupted medially by a roundish black circle with a dibber-shaped yellow spot in its middle, spots not reaching the margin; spots on the fourth segment enlarged postero-medially; fifth segment with triangular spots on the basal corners and a smaller anterior spot in the middle; in other respects as in the male.

Holotype. ♂, Victoria, B.C., May 5, 1919, (W. Downes).

Allotype. ♀, Saanich Dist., B.C., May 17, 1909 (Downes).

Types in the Canadian National Collection. Paratypes, 40 specimens of both sexes from California, Oregon and British Columbia.

This species is very distinct from *T. geminatus* Say and may be distinguished readily by its very dark shining appearance, and definitely distinguished in specimens which approach *geminatus* in color by the basal process on the hind femora. *T. geminatus* does not appear to be common west of the mountains, but I have specimens from British Columbia. I have seen no specimens of *occidentalis* from east of the Rockies. An occasional specimen has the first band only slightly interrupted.

A GENUS AND SPECIES OF SYRPHIDAE NEW TO CANADA

BY C. HOWARD CURRAN,

Orillia, Ont.

The type species of the genus *Chalcomyia*, *C. area* Loew, was taken in Illinois. A second species, which is herein described, was taken by the writer on May 8th, 1921, at Orillia, on the common wild black or pin cherry. Two specimens were taken late in the afternoon, which was sunny, but a cold wind was blowing. Both specimens were resting upon flowers and resembled a small Muscid. They were a good ten feet from the ground. The legs in this species are entirely deep steely black, as is the general color. *C. area* has the legs considerably pale.

Chalcomyia calcitrans n. sp.

Habitat.—Ontario: early spring; edge of woods.

♂. Length, 6 to 6.5 mm. Eyes bare, moderately separated. Face and front shining deep black, the face, except a broad median stripe, silvery pubescent; cheeks shining; facial pits long, almost as in *Chilosia*. Face without pile, in profile strongly convex, with small but conspicuous tubercle below the middle; oral margin projecting as far forward as the antennal base and produced moderately downward. Vertical triangle with sparse, long black and white pile behind the anterior ocellus; front bare. Posterior orbits with long gray pile below, becoming shorter and more whitish above. First antennal joint black, second brownish yellow, third reddish yellow; arista black, bare.

Thorax, scutellum, abdomen and legs deep shining bluish or greenish black. Thorax with short yellow pile, with some longer black hairs around the sides of the dorsum; pleurae almost bare. Scutellum short yellow pilose, with some longer black hairs apically. Abdomen with short, inconspicuous whitish pile, wholly shining. All the femora somewhat thickened; hind tibiae slightly arcuate, tarsi with pads of golden pubescence beneath.

Wings sub-hyaline, slightly tinged with luteous; stigma luteous.

The abdomen is almost triangular in shape, the hypopygium large and inclined to the right. The color appears bluish black to the naked eye, but slightly greenish black under the microscope. The fly is very shining.

Holotype.—♂, Orillia, Ontario, May 8, 1921 (Curran), in the Canadian National Collection, Ottawa. *Paratype*, ♂, same place and date, in the author's collection.

Since the above description was prepared two further specimens, both males, have been identified. They were taken at McDiarmid, Ont., by N. K. Bigelow, of the Ontario Museum, Toronto. The species is evidently northern in distribution.

BOOK REVIEW

APPLIED ENTOMOLOGY, AN INTRODUCTORY TEXT-BOOK OF INSECTS IN THEIR RELATION TO MAN, by H. T. Fernald, New York: McGraw-Hill Book Company, Inc. p. I-XIV, 1-386, 388 text figures, 1921.

This book, as stated by the author, is intended primarily as a classroom text for students in Agricultural colleges who do not intend to specialize in Entomology but "need it as a part of their agricultural education and particularly as a tool which they can use wherever insects are related to their special lines of work."

In attacking this problem of writing a combined text book of systematic and economic entomology, even for the class of students referred to, the author has undertaken a very difficult task and one which many teachers of the subject feel cannot be done satisfactorily. However, there are many teachers who hold the opposite view. But, whatever the view, this new book will be welcome to all as a valuable contribution to entomology and, whether it is used as a text book or not, it will often be consulted by teachers and students; for it is written in a very readable and interesting style and presents most of the essential facts of elementary systematic entomology in a new and attractive manner and also gives a fairly full account of most of our insect pests and of the methods of their control.

The first 58 pages are devoted almost entirely to an account of the external and internal structures of insects, their development, losses caused by them, nature's method of control, insecticides, fungicides and fumigation. Each of these topics is treated briefly and yet with sufficient fullness to give a good general knowledge of the subject.

The main part of the book, or a little more than 300 pages, is composed of a description of the characteristics and peculiarities of the different orders and of the chief families under these orders, together with a description of the chief insects of economic importance under each family, their habits, life histories and methods of control. Much attention is paid to this economic aspect and in consequence most of the very destructive insects of North America are discussed at considerable length.

There are many good illustrations and a few that are somewhat poor. A few more illustrations, especially of the immature stages of insects in certain orders, would have been an improvement and also the addition of a host index.

The life histories and control measures of the various insects discussed are, with a few exceptions, up-to-date and sufficiently full for the purpose.

There are a few typographical errors and inaccuracies here and there throughout the text but not sufficient to mar the value appreciably.

The book should be very welcome, not only to teachers and to undergraduates in agricultural colleges but also to many others who are interested in entomology.—L. Caesar.

OBITUARY.

THE REV. THOMAS W. FYLES, D. C. L., F. L. S.

The Entomological Society of Ontario has lost its most aged member and one of its most devoted friends and supporters through the death of the Rev. Dr. Fyles, which took place at Ottawa on Tuesday, August 9th, 1921, after an operation for some internal trouble; his remains were interred in the Beechwood cemetery on the following Thursday. Born at "The Hermitage", Enfield Chase, England, on the first of June, 1832, he had entered upon his 90th year when he died. After completing his education in London he came to Canada in 1861 and took up his residence in Montreal. In 1864 he was ordained by Bishop Fulford in Christ Church Cathedral and was appointed to the charge of the parish of Ironhill in the Eastern Townships where he was instrumental in building a church and parsonage. After an incumbency of eight years he was transferred to Nelsonville, where also he succeeded in building a rectory; there he remained for eleven years doing faithful work among his parishioners, whose love and esteem he speedily won. In those days the Eastern Townships, lying south of Montreal and the other side of the St. Lawrence were inhabited by English-speaking farmers and others, mostly from "the old country", who were Protestant in their religion and largely members of the Church of England. Now very few of their descendants are to be found in that beautiful and fertile region of country, their places having been filled by French-speaking Roman Catholics.

With his inborn love of nature in all its aspects, Dr. Fyles enjoyed to the utmost the rural scenes and varied life of animals and plants with which he was surrounded. Mountains and hills, lakes, rivers and ponds, woodland streams and swamps, forest glades, flower-spangled meadows, orchard and garden, all were to him full of charm and interest, and gave him the utmost delight. While all nature was full of "the glory of God" and appealed to his heart's deepest emotions, he was devoted especially to the study of the manifold forms of insect life which were everywhere to be found about him. It thus came about that in the course of time he gradually formed a large and beautiful collection of butterflies, moths and other insects. The results of his observation and studies are to be found in many admirable papers which are published in the Annual Reports of the Entomological Society of Ontario, and which he read at its meetings.

In 1883, after spending nearly a score of happy years amid country scenes and kindly people, he removed to Levis, opposite the City of Quebec, and was employed by the Society for the Promotion of Christian Knowledge (London, England) as immigration Chaplain. For twenty-five years he filled this post, meeting all the incoming ships with their varied crowds of new settlers. To them, bewildered often by their new surroundings he was a veritable friend in need, and did much to relieve their difficulties and cheer them on their way. The work was sometimes very arduous when a number of large ships arrived fully loaded with passengers coming to the new lands of this vast Dominion.

During the winter months, when navigation was closed and the port of Quebec securely ice-bound, Dr. Fyles had time to devote to his favourite study

of Entomology. In 1897 he succeeded in the formation of the Quebec Branch of our Society, acting as its President and in fact its mainstay, as after his departure in 1909, the Branch, in spite of heroic efforts on the part of some of its members, gradually died out through having lost its inspiration and its guide. In recognition of his learning and ability, he was appointed Honorary Professor of Biology in Morrin College, Quebec; Fellow of the Linnean Society of London; and given the honorary Degree of D. C. L. by the University of Bishops' College, Lennoxville, Quebec. From 1899 to 1901 he was President of the Entomological Society of Ontario, and its delegate to the Royal Society of Canada in 1890, 1894 and 1895; he was also for many years a member of the Council of the Society and of the Editing Committee of the "Canadian Entomologist."

In 1909 he gave up his work at the Port of Quebec owing in some measure to an accident which had injured his foot and impaired his powers of walking and former activity. Before leaving, his fine collections were transferred to the Museum in the Quebec Parliament Buildings, where, no doubt, they are well looked after and carefully preserved. On his retirement and resignation of active work, at the age of 77 years, he had well earned a period of rest. He spent three years at Hull and in 1912 removed across the river to Ottawa, where he remained until the hour of his death.

Dr. Fyles was a constant contributor during a long series of years, to the publications of the Entomological Society of Ontario. His first papers in the "Canadian Entomologist" were "Notes on a Gall-mite of the Nettle-Tree (*Celtis occidentalis*)" in October, 1882, and "A Description of a Dipterous Parasite of *Phylloxera vastatrix*, *Diplosis grassator*, new species" in December, 1882. The latter was also published, as his first contribution to the Annual Reports, in the Fourteenth, for 1883. Many papers of a descriptive or systematic character appeared in the magazine, but his most characteristic articles were those read at the meetings of the Society and published in the Reports. His inimitable manner of reading and the keen humour that pervaded many of them charmed his audience and will not soon be forgotten by those who had the privilege and opportunity of hearing them.

For thirty-four years he never failed to furnish a paper for our meetings; the last, in 1916 on "The Naturalist in the City", describing various incidents that came under his observation while living in Ottawa. Among the seventy-six papers that appeared in the Reports were many that showed his extensive knowledge of Entomology in most of its orders, as may be learnt from the following titles: "Certain Forms of Neuroptera in their Relation to the Fishing Interests"; "Butterflies" with tables for the determination of the species found in the Province of Quebec; "The Sphingidae of Quebec Province", with similar useful tables; "Dragon-flies of Quebec"; "Crickets"; "Paper-making Wasps"; "Food-habits of Hymenopterous Larvae"; "Hemiptera"; "Two-winged Flies"; "Forest Insects"; "The Tussock Moths"; "Notodontidae" and several others.

His most delightful papers, however, were of a different character and in his own wonderful style that charmed those who heard or read them. The following series may be mentioned especially: "Voices of the Night", "The Pool",

"The Stream", "Green Lanes and Byways", and "Mountains and Hills". In these papers are depicted not only varied forms of insect life, but also observations of other living creatures in air and water and on earth. All living things among animals and plants were of engrossing interest to this keen-eyed lover of nature in all its aspects.

A few other remarkable papers may be mentioned as examples of his literary tastes and skill: "Visit to the Canadian Haunts of Philip Henry Gosse" (author of the "Canadian Naturalist"); "How the Forest of Bedford was Swept Away"; "The Entomology of Shakespeare"; and "Entomological Mistakes of Authors".

Dr. Fyles was no mean artist, as the original illustrations in many of his papers plainly show. He was also in the habit of presenting large colored diagrams of the insects that he referred to in his lectures and addresses. He presented a large, handsomely bound folio volume of these diagrams to the Society's library as an expression of his gratitude for all the Society had been to him during a long series of years.

He was a notable example of an old-time naturalist, a class of nature-lovers now almost extinct in these days of specialization and devotion on some single family or group of insects. His innate interest found scope in his boyish days when, after his father's early death, he spent many summer holidays at the country home of his grandmother, and together with his uncle, Edwin Tearle, at that time a boy of about the same age, roamed the woods and hills in search of birds and butterflies. To this friend and companion he was much devoted and after coming to Canada kept up a long correspondence with the exchange of verses. In the two volumes of poems that he published are references to this friend of earlier days.

The writer may conclude this sketch of a beloved and revered friend with a quotation from a letter received from him a few years ago:—

"I look back and I thank God for the brightening of my life that my connection with the Entomological Society of Ontario has been to me, and yet a feeling of sadness comes over me when I think of the good old friends who have passed "the Great Divide", and every change seems to say—the days darken round us and the years, among new men, strange faces, other minds—and the remembrance of our departed friends calls for thankfulness, for it is a pleasant remembrance, yes, and I am thankful".

Charles J. S. Bethune.

CORRECTIONS AND EMENDATIONS

P. 184. Transpose line 5 to follow line 2.

Prof. T. D. A. Cockerell has called my attention to the fact that the genus *Vitrinella*, proposed by me for a Geometrid genus (1920, Studies in N. Am. Cleorini, 27) is preoccupied by *Vitrinella* Adams (1850) in Mollusca. The name *Anavitrinella* may be used to replace it

I might also note that in the above mentioned paper the species *agrestaria* Grossb. was omitted, by oversight, from the genus *Pterotaea*, although figured under this generic name on Plate VI, fig. 11.

J. McDunnough.

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POPULAR AND PRACTICAL ENTOMOLOGY

THE LIFE HISTORY OF A HOBBY HORSE

BY FRANCIS J. A. MORRIS,

Peterborough, Ont.

PART III.—SECOND CHILDHOOD—THE TREE'S INCLINE.

(Continued from Page 245).

At the head of Corbett's pond the spring after the water level was permanently lowered I spent several hours one Saturday observing a multitude of Plover, Snipe, and Sandpipers feeding on the rich alluvial surface. The first thing I saw on approaching was a flock of seven or eight Black-bellied Plover which I had put up in the forenoon from Duck Harbour four miles away; then two Golden Plover, the only time to my knowledge I have ever seen this bird. Both these kinds were very wild and flew rapidly out of sight up the Ganeraska in a north-westerly direction. By good luck I happened on an excellent "hide", a hollow on the slope of the bank a few yards from the water, screened from the cold north-west wind by the top of the bank and hidden from view by a fringe of willow bushes, through which I could watch the birds feeding. Most of the time my glasses were trained across a narrow arm of the Ganeraska on to a delta of black mud dotted with sand patches, little thickets of dead sticks, and shallow pools of water. The birds were very numerous, the different species moving about in small flocks that often intermingled; sometimes three or four species feeding sociably together in a single group; for the most part they seemed strangely silent, but this was probably due to the distance and the peculiar character of "field-glass" views; birds at quite a distance being brought right up to the eye, so that you felt almost as if you could lay your spare hand on the bird by a sudden pounce down behind the glasses. Moreover I was to windward, and when the breeze dropped I fancied I could hear faint twitterings. It was very interesting to see the quick nervous movements of the birds, almost as restless as Snowbirds in a blizzard, but with much less use of the wings; all showed the curious "teetering" fore and aft, that has given the Least Sandpiper its popular name, accompanied by frequent bobbing of head and neck and flirting of tail; but prettiest sight of all was their quick, clean step and dainty tread about the tiny sandbars and mud flats that made the shores of their Liliputian lakes. There were at least seven species, but I was able to identify five only with certainty: the Least Sandpiper, the Solitary, the Spotted and the Red-backed; the last of these remarkable for the large disk of jet on its belly which gives it the local name of "black-heart" among the gunners; the most exquisite of all these "limicolæ" or mud-haunters was a tiny white-throated, white-breasted and -bellied bird, with a black collar round the neck, a dusky head, and grey-brown back and wings; it looked for all the world like a dwarf Killdeer, and as a flock of Killdeer came down from the field behind me and settled on the delta, I was able to

compare the two at my leisure. The stranger was the Semi-palmated Plover and appeared surprisingly tame; three or four twice crossed the river-arm and settled on the sand just beyond my willow screen, either never suspecting my presence or utterly fearless.

In Choate's Wood itself, a little way above the pond, I heard one day the most awful racket of crows; the noise started with a few sharp caws and rising rapidly to a deafening babel, subsided more slowly into dead silence; after a few moments this performance was repeated. Stepping softly forward through the aisles of beech and maple I presently came upon scores and scores of crows filling the tops of two large trees; at first I couldn't make head or tail of the phenomenon, or rather it seemed to be all heads and tails, without a meaning, though full enough of sound and fury. But presently the mystery was explained. In one tree the crows seemed to keep pretty still, but in the other I noticed they kept hopping and jumping downwards and athwart, gradually edging nearer and nearer to a projecting limb; as soon as my eye rested on the limb the mystery was cleared up. There at the end of a branch sat a large owl, apparently wrapped in meditation and unconscious that the tide of this jabbering parliament was setting its way; soon, however, it began to show signs of nervousness, blinking and turning its neck this way and that; whenever it moved as though to fly the excitement of its persecutors broke out into sharp caws; and when it actually took wing, the whole host of crows from both trees precipitated themselves upon it with deafening cries and it was forced to settle almost immediately. Apparently no crow dared come to close quarters with it as long as it kept its perch.

The North Wood was famous for my first Scarlet Tanager and the Indigo Bunting; it was also a favorite resort of the Crested Flycatcher and the Oven-bird. The fields just northeast of here were memorable for the Bartramian Sandpiper, observed first at the end of April while at its tamest before nesting, and beautifully vocal with its call note in an astonishingly long curve of sound; beginning on a low almost guttural burr and rising energetically like the spirt of a fountain to the top of its pitch, where it passes from trill or burr to a characteristic plover wail that falls away and dies on about the note it opens with—"Pr-r-r-r-ee-cep-wee-ee-ee-ee." During the nesting season the birds are seldom heard even at the moment of alighting, while raising the wings over the head and folding them slowly down to the sides; this is their favorite call moment at other times, but while eggs and young are in the nest they forego even this. South of the "Rockies" lies a great stretch of pasture lands, in which the Bartramian Sandpiper has lately come to breed in great numbers, and here occasionally in early spring I have had the pleasure of flushing a small flock of Yellow-legs from marshy pools; their attitudes, movements and sounds of alarm before taking to wing, being all most interesting to note.

The Newtonville Swamp included a very rich sphagnum moss bog at its west end, where I made finds of nearly all the orchids known to me in the Rideau district as well as some new ones; it was also the scene of several of my most interesting bird discoveries. I took field glasses with me on my first trip there and while gloating over a wealth of Stemless Ladies' Slippers growing

in the shade of pines and among bushes of huckleberry, I heard at intervals what absent-mindedly I set down as the distant hoot of an owl, soft and plaintive; suddenly, I sat up and listened attentively,—an owl? at noon? on a bright June day? What a fool I was! By noting the direction of the sound I was soon able to train my glasses on to a small group of trees not very far away and to my delight discovered the singer on a high branch of white pine; from colour and shape, especially the head and neck, it appeared to be a pigeon; taken in conjunction with its call the evidence pointed conclusively to the Mourning Dove; the call has great charm, being softly plaintive, suiting the lonely swamps and pine woods where it loves to dwell. One of the prettiest sights I have ever seen was a family of four of these birds perched side by side on a pine branch overlooking a stretch of hazel and scrub oak in which I had been studying a colony of ground robins (the Chewink or Towhee).

Not very long afterwards, on the edge of this Newtonville Swamp, as I sat munching some bread and cheese on a hummock of moss, I heard almost over my head the ineffably sweet call of the "White-throat" Sparrow (the Peabody or Canada bird), and with my glasses was able to detect the songster in a tamarac almost at my side. When these birds first come back in the spring they linger for days about the gardens and orchards, and like the Warblers on their migration flight are very sociable; I once saw three species of sparrows all together in the top of a spruce beside my window at the School; two of the birds were the White-throat and the White-crowned Sparrow. The bird sings all the season and there is hardly any secluded swamp where it may not be heard; in the Algonquin Park their call is on every side from June until August. Yet again in this swamp while botanizing with an old college friend from Liverpool we were attacked by a large pair of hawks, and finally surprised two young ones just able to fly, in the centre of a great trodden space that can best be described as a shambles; three rabbit skulls, two pair of yellow hen's legs, a crow, and many gruesome tufts of fur and feathers being scattered about. One day in this swamp while taking some boys of the school Field Club to see the Pitcher Plants, Sundews, Orchids and Heaths, we surprised a Bittern on its nest; I do not think we should have seen the bird at all but it betrayed its presence by an angry hiss like a snake's, and presently we saw the long sharp dagger of its beak with a glittering eye behind it (the jewel in the haft) thrust up through a clump of Black Huckleberry (*Gaylussacia resinosa*). Among the boys at the school was a little Swiss from Mexico who once brought me from his home a bunch of some tropical orchids gathered from a tree; I had these set up in a greenhouse in sphagnum moss and two years later they thrust out a gorgeous display of blossoms. This boy was fairly fascinated that day in the swamp by his first sight of the insectivorous plants of the sphagnum. When the botanical collections were handed in that July, I found among my Mexican pupil's specimens a beautifully pressed pair of Pitcher-plant leaves with the long-stalked nodding flower between, and underneath, the legend—"Jug-plant!"

This Field Club had certain highly prized privileges; the boys were given extended bounds and an occasional half holiday for an outing in June. As birds' nesting was taboo and flower hunting tame to many of the robust

spirits, these last appear to have put their heads together one spring in secret conclave.

We never know what is in the lap of the gods, and the day that followed our Field Club's Spring "revival" meeting, dawned much as other April days; it was only months later that I realized how big with history it had been. Shortly before breakfast a deputation of six boys filed into my room to know if I would add to the annual prize competition of Flowers, Foliage and Ferns, by including Insects, and admit them to the Club as bug-hunters.

After a little consideration I agreed to this, and wrote a short article on the comparative advantages of collecting Butterflies and Moths, or Beetles, which appeared in the next issue of the School magazine. I may have emphasized the ease of setting and preserving beetles as against the difficulty of catching and mounting butterflies. It was fate's irony if I did. At any rate about five pairs of partners applied for membership and three of these chose beetles for their hobby. I had already copies of Holland's two books on Butterflies and on Moths, and identification was fairly straightforward in the Lepidoptera; though I am free to admit being greatly relieved at the end of the summer to find, in a big collection of sixteen cases made by a pupil at Grosse Ile, Michigan, that nearly all the specimens had been determined and named by the collector and his sister at home during the holidays.

But Beetles were a horse of another colour altogether, and I soon found myself in a hopeless quandary over their names. Boys came to my room morning, noon, and night, with specimens to be identified, and in a few weeks, out of sheer desperation I began a collection for myself, and secured a copy of Comstock's "Manual for the Study of Insects", Le Conte and Horn's "Key to the Generic Classification of North American Coleoptera", and Knobel's Illustrated Booklet on "Beetles of New England". In a month I was in an advanced stage of the disease, and have suffered an annual outbreak of it ever since, just as regular in its recurrence as ague or a dose of Poison Ivy.

The most enthusiastic pair of Beetle collectors in the Club—apart from the President and his runningmate, a dentist in the town—were a boy from Algoma Mills near the Soo and his partner from New Orleans. One of these young bug-hunters had done some reading on the subject, and by a process of reasoning not uncommon had framed an infallible test for all possible beetle-problems; whenever the whoop of a new capture went up, Whitney McQuire could be heard shouting breathlessly, as he raced to the scene of action—"Did you count its legs?" I suppose his syllogism must have run like this: All insects are six-leggers; Beetles are six-leggers; *argal* All six-leggers are beetles. I am afraid I may have helped to clinch this Dogberry reasoning, for I ruled out two specimens of sow-bugs and a flat spider-scorpion, taken by him under bark, from his first collection of beetles on the score of an improper complement of legs. Of course, the counting of legs has its uses, but also its limitations. It obviously wouldn't have made any difference to the Scotch gardener who accused my cousin once of stealing strawberries, and received the suggestion that birds had been the thieves with a wise head-shake and the remark: "Ah! Mr. Harry, two-

legged birds"—an unhappy improvement on the proverbial mice. And I doubt whether it would have helped the railway guard in his famous dispute with Frank Buckland. We are told that Buckland was just boarding a train with a pet monkey when he was stopped by the guard and told that he must pay for his pet's journey in accordance with the company's regulations governing dogs; to enforce his protests the naturalist drew a live tortoise out of his coat pocket and said, "Well! what about this?" The man scratched his head completely non-plussed for a moment; then a happy thought spread across his face in a broad grin, as he answered, "Oh! that's all right; that's a hinsec', and they're free." The world hasn't moved far since Buckland's day and I have often been applied to for advice not strictly entomological. I remember once a hurry call over the 'phone from a drug store, when the following conversation took place: "Hello! Is that Mr. Morris?" "Yes." "Is it you that's interested in bugs?" "Yes." "Well! say, there's a big lizard down in the cellar and we'd like you to come and see it."

As most of my papers in the "Entomologist" describe in detail the symptoms of this now familiar *Coleopteritis*, I shall not say more about it here. As child, as boy and man, and in this second childhood of finding my feet in a new world, from first to last my interest has been purely an amateur's delight in the beauties of Nature. All that can fairly be asked of a hobby is to give pleasure; utility is a mere accident, and it would be waste of breath to recommend the pastime where it affords neither pleasure nor interest. I suppose it is quite illogical of me, therefore, to cherish as I do the memory of a rare occasion on which my hobby was translated into terms of dollars and cents.

One summer evening as I sat in my room I heard a rig drive hastily up to the school; in less than a minute my door was flung unceremoniously open, and in rushed a stout man with spectacles, breathless with excitement, his arms full of a mass of meadowgrass and weeds. As soon as he could speak he told me he had been calling at a farm house and while he talked at the door, his mare, a valuable race horse, had cropped some weeds on the edge of an orchard and got poisoned. She was lying in the stable frothing at the mouth and heaving. If I could tell him what the poison was he thought he could save the animal. He was a Vet. by profession and knew the common antidotes. I took the sheaf of herbage from him and looked it carefully over. There were no flowers, but I noticed some tall, rank stems with tiny buds on them and dark divided leaves that looked like a buttercup's. Hastily turning up Britton and Brown I ran through *Ranunculaceae*, and *cureka!* it was aconite. The antidote was administered and the mare recovered:—*post hoc, ergo propter hoc*; the Vet. credited me with the cure, and not long after I was shown an entry in the Bursar's ledger:

Item: To attending School cow during sickness—\$12.00
cancelled on account of having my mare saved by a member
of the school staff.

Like Lucky Hans I had swapped my horse for a cow.

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA)

BY DR. JOHN D. TOTHILL,

In Charge of Natural Control Investigations, Entomological Branch, Ottawa.

(Continued from Page 252).

***Ernestia platycarina* sp. n.**

Description of male. Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi ranging from yellow to black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to the base of the eye equal to about one-third of the eye height. Sides of the face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments black; third segment about one and one-half times as long as the second. Arista thickened on basal two-fifths, the penultimate segment slightly longer than broad. Width of the front at the narrowest point measuring a shade less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, darkbrown, at the narrowest point about equal to the width of either side of the front just cephalad of the ocellar triangle. No orbital bristles, ocellars well developed and proclinate, the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes distinctly rufous at the apex. Three sternopleurals; three to four dorsocentrals, these showing considerable variability; scutellum with three marginal pairs of macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3} . Bend of M_{1+2} without an appendage. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third abdominal segment somewhat arcuate. The fifth tergum marked off—especially laterally—by a suture from the sixth, and at the lateral part being about one-fifth as long as the lateral part of the fourth segment. The sixth and seventh abdominal segments forming the somewhat prominent genital segments.

Genitalia rufous. The basal part of the outer forceps with a broad, leaf-like expansion; the basal part of the inner forceps with a short, keel-like median projection. The edge of this projection farthest from the penis is flattened, and this forms a ready means of distinguishing the species.

The horseshoe-like indenture extends about two-fifths to the base of the fifth sternite.

Described from ten males collected by Messrs. R. S. Sherman, A. M. Caudell, C. H. T. Townsend and William Palmer, from Savary Island, B. C., Bear Lake, B. C., Franconia N. H., White Mountains, Peaks of Otter, Va., and Great Falls, Va.

Type, No. 24359 in the U. S. N. M., Washington, D. C. Paratypes in the National Collection at Ottawa.

***Ernestia sulcocarina* sp. n.**

Description of male. Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi yellowish at tip; infuscated below. Eyes hairy. Cheeks (below the eye) white pollinose on black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of the face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose, without a carina. Antennae reaching the lowest fourth of the face, the first and third segments black, the second black, but usually reddish at distal end; third segment about one and one-half times as long as the second. Arista thickened on basal half, the penultimate segment somewhat longer than broad. Width of front at narrowest point measuring less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at the narrowest point as wide as either side of front just cephalad of the ocellar triangle. No orbital bristles; the ocellars proclinate; the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes somewhat rufous toward the apex. Sternopleurals variable, sometimes three, sometimes four; four dorsocentrals; scutellum with three marginal pairs of macrochaetae and an apical cruciate pair. Legs black; the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{1+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3} . Bend of M_{1+2} with a minute appendage in some cases. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third segment arcuate. The fifth tergum marked off from the shining sixth by a somewhat faint suture, laterally it is about one-fourth as long as the neighboring part of the fourth segment. The sixth and seventh abdominal segments forming prominent genital segments.

Genitalia black. The basal part of the outer forceps with a broad, leaf-like expansion. The basal part of the inner forceps with a median keel-like projection and the edge of this projection furthest removed from the penis is sulcate.

The horseshoe-like indenture extends about three-fourths of the distance to the base of the fifth sternite.

Described from ten males taken by Messrs. C. Garrett, A. B. Baird

and J. B. Wallis at Cranbrook, B. C., Lillooet, B. C., and Husavick, Man., also one male taken by J. M. Aldrich at Anchorage, Alaska.

Type in the National Collection at Ottawa. Five paratypes, No. 24358, in the U. S. National Museum, Washington, D. C.

***Ernestia bicarina* sp. n.**

Description of male. Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lower fourth. Facial depression silvery pollinose without any carina. Antennae in male reaching the lowest fourth of face, all three segments black; third segment about one and one-fourth times as long as second. Arista thickened on basal two-fifths to one-half, the penultimate segment from one and one-half times to twice as long as the first. Width of front at narrowest point measuring less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point equal to the width of either side of front just cephalad of the ocellar triangle. No orbital bristles in male, the proclinate ocellar bristles somewhat weak; the single row of frontal bristles descending almost to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that is very faintly tinged reddish, especially at the apex. Three sternopleural bristles and three pairs of dorsocentral macrochaetae; scutellum with three pairs of marginal macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3} . Tegulae white.

Abdomen subshining; lightly silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third tergum strongly arcuate. The fifth tergum distinctly marked off by a suture from the shining sixth and being a third as long laterally as the lateral part of the fourth. The sixth and seventh abdominal segments forming somewhat distended genital segments.

Genitalia black. The basal part of the outer forceps is extended into a broad, leaf-like portion. The basal part of the inner forceps with two median keel-like projections placed side by side and resulting evidently from the splitting of what was originally one median keel-like projection.

The horseshoe-shaped indenture extends about two-fifths the distance to the base of the fifth sternite. Each prong tipped with a short spine.

Described from four males from Bear Lake, B.C., Boseman, Montana, and Tennessee Pass, Colorado, taken by Messrs. R. P. Currie and R. Parker.

Type No. 24359 in the U. S. National Museum, Washington, D.C. One paratype in the Canadian National Collection at Ottawa.

***Ernestia ampelus* Walk.**

Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to the base of the eye equal to about one-third of the eye height. Sides of the face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose without any carina. Antennae reaching the lowest fourth of the face, in male all segments black except the distal end of the second, which is usually reddish; in the female the first two segments reddish-yellow, the third segment black; in both sexes the third segment about one and one-fourth times as long as the second. Arista thickened on basal two-fifths to one-half, the penultimate segment about twice as long as broad. Width of front at narrowest point measuring in male about the length of, in the female about twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown; at narrowest point as wide or slightly wider than either side of the front just cephalad of the ocellar triangle. Orbital bristles present in female, absent in male; ocellars well developed, especially in the female; the single row of frontal bristles descending almost to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes rufous toward the apex. Three sternopleural and four dorsocentral macrochaetae, scutellum with three pairs of marginal macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to seven hairs both above and below at the junction of R_{2+3} ; bend of M_{1+2} appendiculate in some of the males, destitute of an appendage in most of the females. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground; the fourth abdominal segment in the female rufous. Discal and marginal macrochaetae present on second, third and fourth abdominal segments. The hind margin of the third tergite not conspicuously arcuate even in the male. Fifth tergite in male black or rufous and marked off from the sixth by a suture only on the lateral parts, its greatest length equal to one-fifth the length of the lateral part of the fourth. The sixth and seventh abdominal segments forming in the male prominent genital segments.

Male genitalia rufous. The basal part of the outer forceps covered by a leaf-like expansion. The basal part of the inner forceps with two conspicuous projections placed side by side, seemingly derived from forms in which a keel-like projection had become split.

The horseshoe-like indenture in the male extends about two-fifths the distance to the base of the last sternite.

Redescribed from a long series of males and females in the U. S. National Museum and the National Collection at Ottawa.

This is the principal Tachinid parasite of *Hyphantria cunea* in both eastern and western Canada.

***Ernestia fissicarina* sp. n.**

Description of male. Head at vibrissae about as thick as at base of antennae. Vibrissae well above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width equal to the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose without any carina. Antennae reaching to the lowest fourth of the face, the first two segments yellowish, the third black; third segment about one and one-half times as long as the second. Arista thickened on basal three-fifths, the penultimate segment about twice as long as broad. Width of front at narrowest point equal to about one-half the width of an eye and equal to almost twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, reddish brown, at narrowest point slightly more than half the width of front at vertex, i.e.; unusually broad. No orbital bristles, the proclinate ocellars well-developed; the single row of frontal bristles descending considerably past the insertion of the second antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes rufous toward the apex. Three sternopleural bristles and four pairs of dorsocentrals; scutellum with only two pairs of marginal macrochaetae and with an apical cruciate pair; the cruciate pair and the pair next to it are directed at right angles to the dorsum. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3} ; bend of M_{1+2} destitute of an appendage. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third abdominal segment somewhat arcuate but not strikingly so. The fifth tergum marked off rather indistinctly from the shining sixth and at the lateral part being about one-fourth the length of the lateral part of the fourth. The sixth and seventh abdominal segments forming fairly prominent genital segments.

Genitalia black. The basal part of the outer forceps covered by a leaf-like expansion. The basal part of the inner forceps with a median keel-like portion that has become split, each half of it having become reduced to a mere knob, as in the case of *Ernestia ampelus* Walker.

The horseshoe-like indenture in the male extends about half the distance to the base of the last sternite.

Described from a single male collected by Mr. E. P. Van Duzee at Pismo, California on April 25th.

Type in the California Academy of Science, San Francisco.

NEW SPECIES OF CANADIAN SYRPHIDAE, (DIPTERA) Pt. I.

BY C. HOWARD CURRAN,
Orillia, Ont.

Melanostoma squamulae, new species

Head and thorax wholly black pilose; squamae blackish or brown, fringed with black pile.

Length, 7.5 to 9 mm. Male. Face a little prominent below, very little concave between the antennal base and tip of tubercle which is more prominent than, and close to the oral margin. Face greenish black, scarcely pollinose on the sides. Antennae black, third joint brown, its base reddish; arista brown. Frontal triangle chiefly opaque black. Head and thorax everywhere with rather longish black pile. Thorax and scutellum deep greenish black, with a bluish reflection in some lights, on the disc somewhat opaque. Abdomen opaque black, the sides of a shining bronze color which is a little broadened on the sides of the second segment, and produced as triangular areas on the anterior half of the third and fourth segments; fifth segment greenish bronze colored. Pile on the sides of the abdomen all black, with many longer, stronger black hairs, on the disc, shorter, more or less yellowish. Legs black, knees yellow, anterior four tibiae and tarsi brownish red, all the tibiae with a row of strong hairs in front. Wings distinctly brownish or blackish, stigma and subcostal cell luteous. Squamae brown, the fringe of hairs black.

Female. Front broad, shining greenish black, the broad transverse depression appearing opaque; black pilose. Thorax chiefly yellowish white pilose, but with longer black hairs intermixed on the dorsum and on the scutellum. The shining portion of the abdomen is aeneous greenish, the shining bands all wider than in the male and the opaque on the third and fourth segments is interrupted medianly, the shining band on the fourth segment is complete; pile whitish; legs with the tibiae and tarsi more extensively reddish yellow. Squamae tinged with brownish, with brown fringe. Wings slightly clouded beyond the middle.

Holotype, ♂, *Allotype*, ♀, Victoria, B.C., April and May, in the Canadian National Collection, Ottawa.

Paratypes, 3 ♂s, Victoria, B.C., in the National Collection and the writer's collection.

The male seems very distinct from any described species and is a very dark appearing insect. The almost wholly shining face is very distinctive in both sexes, as are the brownish or blackish wings in the male, and the clouded wing in the female, although this dense coloration may not hold good in a long series. The female resembles *M. obscurum*, etc., but the shining, less prominent face and darkened squamae at once distinguish it from other species.

Melanostoma chilosia, new species

Abdomen (♀) wholly shining; tubercle and oral margin very prominent.

Length, 6.5 mm. al. 5.5 mm. ♀. Face shining black, thinly whitish pollinose, leaving the tubercle and a stripe on the cheeks wholly shining; in profile a little produced to the prominent, rather pointed tubercle, below which it is rather moderately and shortly concave to the not quite so prominent oral tip; face produced very slightly downwards anteriorly. Front deep shining black,

broad, with black pile; Pile of head, thorax and abdomen whitish, or a little yellowish on dorsum of thorax. Thorax, scutellum and abdomen shining metallic bluish black. Legs black, knees reddish, anterior four tibiae and tarsi brownish. Squamae and fringe of hairs whitish; halteres yellowish. Wings hyaline. Stigma pallidly yellowish.

Holotype, ♀, Banff, Alberta, (N. B. Sanson), in the Canadian National Collection, Ottawa.

This species is very distinct from any other species I have seen, and is very similar in every respect to *Chilosia* but lacks the facial grooves.

Melanostoma lata, new species

Large; face evenly thinly yellowish gray pollinose; otherwise very much like *M. stegnum* Say.

Length 10 mm. al. 9 mm. ♀. Face and front shining, rather greenish or bluish black, the ground color sub-obscured, except on the tubercle and except a median band on the front, by yellowish gray pollen. In profile the lower part of the face is prominent, and is produced a little downwards, the tubercle about as prominent as the oral margin. Antennae black, third joint brown, about as long as the first two together, its apex evenly rounded; arista brown, not much longer than third joint. Front broad, black pilose; head elsewhere whitish or yellowish pilose. Thorax and scutellum shining deep blue-black, with short, abundant straw-colored pile, the middle of the dorsum with stouter black pile. Abdomen opaque black, the first segment, triangular spots on the anterior half of the second, a broad crossband on the posterior half of the third and fourth segments shining aeneous greenish. Pile of abdomen, where discernible, pallidly straw-colored, but extremely short on the disc. Legs with the femora, except the ends, black, tibiae brown, their bases and ends of the femora yellow; tarsi black, hind basitarsi a little swollen, especially basally. Wings slightly yellowish, the stigma and subcostal cell light brownish.

Holotype, ♀, White Horse, Yukon Territory, July-Aug., 1920, (A. P. Hawes), in the Canadian National Collection, Ottawa.

This species bears a striking resemblance to *M. stegnum* Thoms., but is distinct in the evenly pollinose face, dark haired thorax, darker tibiae; front slightly broader; the opaque crossbands on the third and fourth abdominal segments are entire.

MICROLEPIDOPTERA FROM BRITISH COLUMBIA

BY AUGUST BUSCK,

U. S. National Museum, Washington, D. C.

OECOPHORIDAE.

Carcina quercana Fabricius.

Among a large number of Microlepidoptera determined last winter for Mr. E. H. Blackmore of Victoria, British Columbia, were several specimens of this well known European species, hitherto not recognized outside of Europe and Asia Minor.

The species is a striking form both in structure and in color with long thick light yellow antennae reaching beyond the tips of the bright yellow and purple forewings. The larva feeds, according to European records, in a slight web on the under side of *Quercus*, *Fagus* and *Pyrus*.

The genus *Carcina* Hubner, of which *quercana* is the type and the only known species belongs to the family *Oecophoridae* and has the following characters: Forewings 12 veins, 7 and 8 stalked; 7 to termen; 3 and 4 stalked; 2 remote from 3. Hindwings 8 veins; 6 and 7 parallel; 3 and 4 connate. Labial palpi long recurved. Antennae longer than forewings, thickened in the males; basal joint with pecten.

The obvious specific identity of the American specimen with the European has been definitely proven by an examination of the genitalia of specimens from both continents.

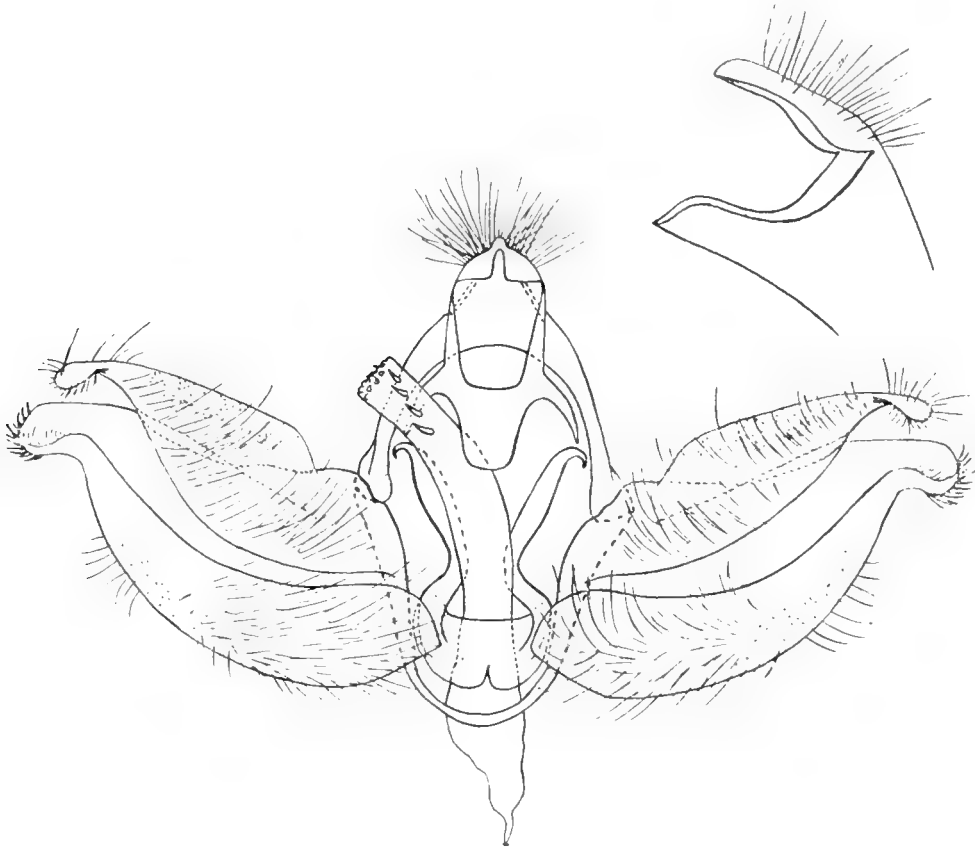


Fig. 1—Male genitalia of *Carcina quercana* Fabr.

***Agonopteryx blackmori* new species.**

Labial palpi light ochreous; second joint sparsely sprinkled with black exteriorly; terminal joint with ill defined and incomplete black annulation below apex; brush on second joint short, even and divided. Face light ochreous; head slightly darker; a pink streak below the eyes; thorax light ochreous fuscous with divided reddish yellow posterior tuft.

Forewings light reddish ochreous with paler ochreous basal and costal streak, this latter and the entire apical half of the wing sparsely sprinkled with black; a single small but conspicuous black first dorsal spot; a single small whitish second dorsal spot surrounded by brown and rust-red scales which are continued in an longitudinal streak before the end of the cell; apical and terminal cilia and the extreme edge of the wing dark purple. Hindwings light whitish ochreous. Abdomen light ochreous fuscous; underside sprinkled with black dots. Legs ochreous with dusky tarsal joints; anterior tibiae touched with pink.

Alar expanse: 20 to 22 mm.

Habitat: Victoria, B.C., (E. H. Blackmore).

Type, U.S. Nat. Museum No. 23500; *Cotypes* in the National Collection, Ottawa and that of E. H. Blackmore.

This species was reared by Mr. Blackmore from leaf-rolling larvae on Broom and is named in honor of the collector, who has added considerably to our knowledge of British Columbian Microlepidoptera.

The species is nearest to and very close to the European *Agonopteryx costosa* Haworth, which is also a broom feeder. The genitalia are apparently identical, but they are very similar throughout the genus. The species is the American representative of *A. costosa* but must be retained as distinct. The forewings are much more mottled with black and the rosy color of the apical edge in *A. costosa* is replaced by dark purple in *A. blackmori*.

TORTRICIDAE

***Cacoecia victoriana* new species**

Labial palpi light brown, whitish on the inner side. Face, head and patagia light brown. Thorax yellowish. Forewings light ochreous with dark blackish or burnt brown markings; a large, oblique, transverse, dark fascia from before the middle of costa to tornus broadens out triangularly on the middle of the wing to the end of the cell; a small triangular brown costal spot at apical fourth and the base of costal edge dark brown; the terminal veins indicated by brown scales and the terminal part of the wing faintly irrorated by transverse wavy black lines. These latter, as well as the darker scales on the veins are easily lost in flown specimens which appear dirty ochreous on the apical third of the wing. Hindwing very light ochreous, nearly white. Abdomen dark fuscous above with ochreous underside and anal tuft. Sexes nearly the same size.

Alar expanse: 18 to 20 mm.

Habitat: Victoria and Goldstream, B.C., (E. H. Blackmore).

Type, U.S.N.M. No. 23501; *Cotypes* in collection of E. H. Blackmore.

The species is close to *Cacoecia fractivittana* Clemens and very similar in coloration to the female of this species but smaller and with only slight sexual differences in color and size.

GLYPHIPTERYGIDAE

***Hilarographa youngiella* new species.**

Labial palpi white; second joint brown exteriorly; terminal joint with a longitudinal black line on the underside. Face light silvery fuscous. Head and thorax dark purplish fuscous. Forewings dark purplish brown; five outwardly oblique, silvery white costal streaks; edged with black scales; the two first nearly meet two outwardly oblique dorsal white streaks; between these latter a third less pronounced parallel white streak; before tornus two shorter white dorsal streaks; a central longitudinal line from base of the wing and entire apical half of the wing overlaid with golden yellow, between the apical white streaks, which terminates in faint bluish metallic scales; just above tornus a perpendicular row of four small black dots. Cilia bronzy black with a white spot at apex and a white tuft below apex, giving a sinuate effect to the wing. Hindwings dark bronzy brown. Abdomen dark brown above, underside with a broad silvery transverse band on each segment.

Alar expanse: 12 mm.

Habitat: Departure Bay, B.C., (C. H. Young); Victoria, B.C., (W. Downes).

Type in Canadian National Collection, Ottawa; *Cotype*, U.S. National Museum No. 23502.

Named in honor of my friend C. H. Young, who has added very many new records of Microlepidoptera from Canada and whose exquisitely mounted specimens add charm to any collection.

This is the first record of the Glyphipterygid genus *Hilarographa* Zeller, from North America, but *regalis* Walsingham described as a *Glyphipteryx* is also referable to this genus.

The genus has been considered tropical, ranging from India to Africa and best represented in Central and South America; one species is recorded from Japan. The food plant of *Hilarographa regalis* is *Pinus sabiniana* and I expect the present species also feeds on conifers.

Hilarographa Zeller, of which the Central and South American *H. swederiana* Stoll is the type, has the following characters. Labial palpi somewhat flattened, slightly tufted; terminal joint tolerably pointed, about as long as second. Forewing broadly triangular; 12 veins, all separate, 7 to termen, 3 from before the end of the cell, 2 before three-fourths of the cell, 1b furcate at base. Hindwings broader than forewings, triangular rounded, 8 veins, 6 and 7 stalked, 3 and 4 connate.

Male genitalia with 8th segment strongly modified as a covering for the genitalia proper; uncus sharply pointed; aedoeagus long, stout, straight; annulus broadly heartshaped; vinculum narrow.

The genus *Scotiostoma* Zeller, type *xanthobasis* Zeller, which was described in this family and which has hitherto been placed close to *Hilarographa* Zeller (according to Meyrick actually a development from it) has no affiliation whatever with this group, but belongs to the family *Stenomidae*, (not equal *Xyloryctidae* Meyrick) constituting a typical genus of that family, amply differentiated generically by vein 7 of the forewing to costa, but otherwise with every characteristic of that family. Its wing form and ornamentation indicate that it is probably developed from forms similar to *Stenoma lactis* Busck and *Stenoma orion* Busck.

From the venation and oral characters alone *Scotiostoma* may be mistaken for Glyphipterygid, as indeed it has been all along, though careful study of these characters also clearly shows its true relations, but the genitalia give these at once and without doubt.

The genitalia of *Scotiostoma* are typical Stenomid in every respect and very different from anything in the *Glyphipterygidae*. The evidence of the genitalia is so clear cut and conclusive that there can be no doubt about the position of the genus. It is one of the very many instances, where the value of the genitalia as an aid in the systematic work becomes apparent to anyone, who will look into the subject even superficially.

YPONOMEUTIDAE

Argyresthia monochromella new species.

Labial palpi dark fuscous. Face golden fuscous. Tuft on head light

reddish yellow, not metallic. Thorax golden fuscous. Forewings unicolorous shining golden yellowish fuscous with a slight greenish tint. Hindwings light fuscous with yellowish cilia. Abdomen dark fuscous with yellowish anal tuft. Legs light silvery fuscous.

Alar expanse: 13 mm.

Habitat: Victoria, B.C., (E. H. Blackmore).

Type and *Cotype*, U. S. National Museum No. 23503. *Cotypes* in collection Blackmore.

This striking species may eventually prove to be the only other described N. A. unicolorous species, *A. altissima* Chambers, which was described from Colorado, 11,000 altitude, and the unique type of which I have studied in Cambridge; but aside from the different localities, the present species appears to differ in the strongly yellow head and the more golden metallic color of the forewings and it would be unwarranted to identify it as Chambers' species from present evidence. The present species has veins 7 and 8 of the forewing stalked.

CYGNODOIDEA

***Aphelosetia cygnodiella* new species.**

Labial palpi dark brownish fuscous. Antennae dark brown, basal joint with strong pecten. Head and thorax dark brownish fuscous. Forewing with basal fourth dark fuscous, rest of the wing strongly overlaid with white, the brown appears as irregularly scattered scales; a long blackish brown spot on the middle of the field, a smaller blackish spot at the end of the cell; cilia light fuscous with a blackish brown transverse line near base formed by overlying white black-tipped scales on terminal and apical edges of the wing. Hindwings brownish fuscous with light yellowish fuscous cilia. Abdomen blackish fuscous with small yellowish anal tuft. Legs blackish fuscous.

Alar expanse: 11 mm.

Habitat: Victoria, B.C., (W. Downes).

Type, Canadian National Collection, Ottawa. *Cotypes*, No. 23504 in U. S. Nat. Mus.

The name *Aphelosetia* Stephens must, as shown by Walsingham, be employed for *Elachista* Auctores, type *argentella* Clerk. (Treitschke in part).

The genus belongs to the superfamily *Cygnodoidea* Busck and differs from *Cygnodia* Herr-Sch. in the absence of one dorsal vein of each wing. Vein 7 bis (9) in the hindwing is present in *cygnodiella* Busck, but tends to become obsolete in most of our American species.

NEARCTIC RECORDS FOR SPECIES OF MIRIDAE KNOWN HERETOFORE ONLY FROM THE PALAEARCTIC REGION (HETEROP.)

BY HARRY H. KNIGHT,¹

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During the past few months the writer has been able to obtain a considerable collection of Palaearctic Miridae, besides having opportunity to study a large number of species determined by Reuter and sent to the late Mr. O. Heidemann. The material at hand for comparing Nearctic species with those

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*References marked with an asterisk have not been verified in the original.

from the Palaearctic region makes it possible to add nine species to the list of forms common to both regions. Dr. Horvath (1908)², in the most important contribution on this subject, records twenty-seven species of Miridae as common to both Palaearctic and Nearctic regions. One of these, *Lygus viridis*, the present writer (1917b)⁴ has shown to be different from *viridis* Fallen, and described the form as *Lygus alni*.

In a previous contribution the writer (1917a)³ recorded three species new to the Nearctic region, gave definite records for two species regarded as doubtful and indicated that *Neobothynotus modestus* Wirtner was in reality *Bothynotus pilosus* (Boheman). The latter opinion has recently been shared by Dr. Bergroth (1920)⁵ in a paper where *N. modestus* Wirtner is placed as a synonym of *Bothynotus pilosus* (Boheman), and the species recorded as representing a division of the subfamily Cylapinae.

Of the Palaearctic species recorded from North America a few appear very doubtful and require verification. It has been possible to trace some of the doubtful forms but others are recorded without exact records of specimens, thus it is impossible at the present time to check the determinations. Records for *Cyllecoris histrionicus* (Linn.), *Globiceps flavomaculatus* (Fabr.), and *Macrotylus herrichi* (Reut.) certainly require verification. *Orthotylus diaphanus* (Kirsch.) was recorded by Tucker (1907)⁶ on the authority of a doubtful determination by Heidemann. One of these specimens (♂ June, Lawrence, Kans. E. S. Tucker) stands in the Heidemann collection with a determination label by that author which reads "probl. *Orthotylus diaphanus* Kirsch." This form is smaller and has different genital claspers from *diaphanus* Kirschbaum, as determined and figured by Reuter (1883)⁷. The Tucker specimen is most closely related to *translucens* Tucker, but smaller and evidently undescribed.

An examination of European examples of *Reuteria marqueti* Puton and comparison of the genital claspers with those of *Reuteria irrorata* (Say) demonstrates that the two species are not identical. Records for *Oncotylus punctipes* Reuter from North America as based on identifications by Van Duzee and Heidmann, and examined by the writer, refer to *Plagiognathus chrysanthemi* (Wolff). The writer has previously shown that our records for *Mecomma ambulans* (Fallén) refer to *Mecomma gilvipes* (Stal), and the records for *Orthocephalus saltator* (Hahn) may be referred to *Irbisia* sp. and perhaps in part to *Orthocephalus mutabilis* (Fallén).

The present writer is able to account for forty-eight species of Miridae which are common to both Nearctic and Palaearctic regions, but of this number he has not seen *Bothynotus pilosus* (Boheman) and *Apocremnus variabilis* (Fallén) Van Duzee.

²1908 Horváth, G., Les Relations entre les faunes Hémiptérologiques de l'Europe et de l'Amérique du Nord. In Ann. Mus. Nat. Hung., vi, pp. 1—14.

³1917a. Can. Ent., xlix, pp. 248—252.

⁴1917b. New York (Cornell) Agr. Exp. Sta. Bul. 391, p. 608.

⁵1920. Bergroth, E. List of the Cylapinae (Hem., Miridae) with descriptions of new Philippine forms. In Ann. Soc. Ent. Ent. Belgique, lx, pp. 67—83.

⁶1907 Univ. Kans. Sci. Bul., iv, p. 58.

⁷1883 Hem. Gymn. Eur., iii, p. 358, pl. 5, fig. 15.

Plagiognathus chrysanthemi (Wolff).

- (?)1778 *Cimex femore-punctatus* Goeze, Ent. Beyt., ii, p. 266.
 (?)1785 *Cimex femoralis* Geoffroy, in Fourcroy, Ent., Paris, i, p. 204.
 (?)1788 *Cimex viridescens* Gmelin, Syst. Nat., edn. xiii, p. 2184.
 1804 *Miris chrysanthemi* Wolff, Icones Cim., iv, p. 157, t. xv, f. 151.
 1807 *Lygacus viridulus* Fallen, Cim. Suec., p. 90.
 1829 *Phytocoris viridulus* Fallen, Hemip. Suec., p. 105.
 1834 *Phytocoris viridulus* Hahn, Wanz. Ins., ii, p. 136, f. 221.
 1835 *Capsus viridulus* Herrich-Schaeffer, Nomen. Ent., i, p. 50.
 1843 *Capsus viridulus* Meyer, Verz. Schw. Rhyn., p. 77, tab. vii f. 2.
 1845 *Phytocoris viridulus* Kolenati, Melet. Ent., ii, p. 124.
 1848 *Capsus viridulus* F. Sahlberg, Mon. Geoc. Fenn., p. 103.
 1852 *Capsus viridulus* Costa, Cim. Regn. Neap. Cent., iii, p. 43.*
 1855 *Capsus (Eurymecocoris) viridulus* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 258; (Sep.) Rhyn. v. Wiesb., Caps., p. 98.
 1860 *Capsus (Capsus) viridulus* Flor, Rhyn. Livl., i, p. 595.
 1861 *Plagiognathus viridulus* Fieber, Eur. Hemip., p. 303.
 1865 *Plagiognathus viridulus* Douglas & Scott, Brit. Hemip., p. 401.
 1871 *Capsus (Plagiognathus) viridulus* Thomson, Opusc. Ent., iv, p. 448.
 1875 *Plagiognathus viridulus* Reuter, Rev. Crit. Caps., [ii], p. 180; Acta Soc. Faun. Fl. Fenn., i, p. 196.
 1875 *Plagiognathus viridulus* Saunders, Trans. Ent. Soc. London, 1875, p. 307.
 1878 *Plagiognathus viridulus* Reuter, Hem. Gymn. Eur., i, p. 74, t. 4, figs. 5 et 6.
 1878 *Lygus viridulus* Snellen v. Vollenhoven, Hem. Het. Neerl., p. 233.
 1883 *Plagiognathus Chrysanthemi* Reuter, Hem. Gymn. Eur., iii, pp. 452, 511.
 1886 *Plagiognathus viridulus* Puton, Cat. Hem. Palea., edn. 3, p. 61.
 1887 †*Oncotylus punctipes* Provancher, Pet. Faune Ent. Can., iii, p. 149.
 1888 *Plagiognathus Chrysanthemi* Reuter, Acta Soc. Sci. Fenn., xv, p. 673, No. 285.
 1890 *Plagiognathus chrysanthemi* Atkinson, Cat. Capsidae, p. 171.
 1892 *Plagiognathus viridulus* Saunders, Het. Brit. Isds., p. 320.
 1899 *Plagiognathus Chrysanthemi* Puton, Cat. Hem. Palea., edn. 4, p. 77.
 1909 *Plagiognathus chrysanthemi* Oshamin, Verz. Palae, Hem. i, p. 923.
 1912 *Plagiognathus chrysanthemi* Jensen-Haarup, Danmarks Fauna, xii, p. 276.
 1912 *Plagiognathus Chrysanthemi* Hueber, Jahr. ver. Nat. Wurt., lxxviii, pp. 212, 219.
 1912 †*Oncotylus punctipes* Van Duzee, Can. Ent., xlv, p. 322.
 1917 †*Oncotylus punctipes* Van Duzee, Cat. Hemip., p. 404.
 1919 †*Oncotylus punctipes* Parshley, Can. Ent., li, p. 72.
 1920 *Plagiognathus Chrysanthemi* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix No. 2, p. 166.

Specimens examined: MAINE—♂, July 8, 1917, Bar Harbor; ♂ ♀ July 14, 1918, South West Harbor (C. W. Johnson). MASSACHUSETTS—♀ July 8, 1918, Mt. Toby (H. M. Parshley). NEW YORK—♂ July 26, 1916, Ithaca; 14 ♂ ♀ June 23, 6 ♂ ♀ June 30, 5 ♂ ♀ July 5, 16 ♂ ♀ July 7, 1920, Ithaca; 30 ♂ ♀ July 3, McLean (H. H. Knight), breeding on *Chrysanthemum leucanthemum* L. ♂ July 1, ♀ July 5, ♂ July 13, ♂ July 15, ♂ July 20, 1920, Cranberry Lake; 12 ♂ ♀ July 15, 1920 Wanakena (C. J. Drake). ♂ ♀ July 2-3, 1904 McLean. ♂ July 4, Freeville. MANITOBA—♀ "Winnipeg". NOVA SCOTIA—♀ July 19, Annapolis County; ♀ Aug. 14, 1918, Digby County; 3 ♂ ♀ July 4, ♂ July 15, 5 ♂ ♀ Aug. 20, 1916, Smith's Cove (W. H. Brittain). 2 ♂ July 12, ♀ July 31, 1913, Truro (R. Matheson). ONTARIO—♀ July 14, Norway Point, Lake of Bays (J. McDunnough). 2 ♂ 2 ♀ July 1, ♀ Aug. 18, Ottawa (G. Beaulieu). QUEBEC—♂ July 1, ♂ July 3, Montreal, (G. A. Moore). 2 ♀ July 24, Chicoutimi; ♂ July 24, Montreal; ♂ July 26, Rigaud (G. Beaulieu).

The writer obtained the first clew to the identity of this species when nymphs and adults were collected on ox-eye daisy (*Chrysanthemum leucanthemum* L.) at Ithaca, New York, 1920. On finding a *Plagiognathus* breeding on this European plant the writer thought immediately of *Plagiognathus chrysanthemi* Wolff, and upon returning to the laboratory, turned at once to references of this species and confirmed the identification. More recently the writer has

been able to make a comparison with European material of *chrysanthemi* Wolff and finds our specimens to be identical in all respects.

***Psallus alnicola* Douglas & Scott.**

- 1865 *Psallus Alni* Douglas & Scott, Brit. Hemip., p. 414. (not Fabricius).
 1871 *Psallus alnicola* Douglas & Scott, Ent. Mon. Mag., viii, p. 62.
 1875 *Psallus alnicola* Reuter, Bihang Kongl. Sv. Akad. Handl., iii, p. 50.
 1875 *Psallus* (*Ps.*) *alnicola* Reuter, Rev. Crit. Caps., [ii] p. 167; Acta Soc. Faun. Fl. Fenn., i, p. 183.
 1875 *Psallus alnicola* Saunders, Trans. Ent. Soc. London, 1875, p. 305.
 1878 *Psallus alnicola* Reuter, Hem. Gymn. Eur., i, p. 126.
 1880 *Psallus alnicola* Reuter, Med. Soc. Faun. Fl. Fenn., v, p. 182.
 1883 *Psallus alnicola* Reuter, Hem. Gym. Eur., Suppl. I—III, p. 522.
 1886 *Psallus alnicola* Puton, Cat. Hem. Palea., edn. 3, p. 60.
 1890 *Psallus alnicola* Atkinson, Cat. Capsidae, p. 160.
 1892 *Psallus alnicola* Saunders Het. Brit. Isds., p. 315, pl. 29, f. 8.
 1909 *Psallus alnicola* Oshanin, Verz. Palae. Hem., i, p. 906.
 1911 *Psallus alnicola* Hueber, Jahr. ver. Nat. Wurt., lxvii, pp. 406, 440.
 1920 *Psallus alnicola* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 163.

Specimens examined: NEW YORK—♀ July 26, 1916, Ithaca, on *Alnus rugosa*; ♀ July 27, 1916, McLean (H. H. Knight). MINNESOTA—♂ ♀ Aug. 20, 1920, Beaver Bay (H. H. Knight).

This species was first recognized from an isolated female specimen taken at Ithaca, but in the absence of European material for comparison the writer hesitated to publish the record. Thorough collecting on the same clump of alders at Ithaca, in 1920, failed to produce additional specimens. During the month of August the writer made a collecting trip along the north shore of Lake Superior, having in mind to search for *Psallus alnicola* on alders in that region. The effort was rewarded when the species was found breeding on *Alnus rugosa* at the mouth of Beaver Creek, Beaver Bay, Minnesota, where that small stream empties into Lake Superior. A large series of nymphs and adults were taken, but all from one group of alders which grew at the waters edge. Specimens were found only on branches which received little direct sunlight, and chiefly on the tender growth at the centre of each bush. This requirement of the species indicates that it can breed only under very favorable conditions of humidity and temperature.

Nymphs of the fifth instar are chiefly red, the wing-pads, pronotal disk, antennae, and legs dusky, apices of wing-pads darker; wing-pads, pronotal disk, and dorsal surface of head thickly dotted with small fuscous points and reddish; tibial spines dark, arising from conspicuous black spots; femora dotted with red on ventral surface, a few black points apically, a pair of larger spots on anterior margin and a second pair on the posterior margin near apex.

***Megalocoleus molliculus* (Fallén).**

- 1829 *Phytocoris molliculus* Fallén, Hemip. Suec., p. 82.
 1835 *Capsus molliculus* Herrich-Schaeffer, Nomen. Ent., i, p. 49.
 1842 *Capsus molliculus* Herrich-Schaeffer, Wanz. Ins., vi, p. 32, f. 589.
 1843 *Capsus molliculus* Meyer, Verz. Schw. Rhyn., p. 78.
 1848 *Capsus molliculus* F. Sahlberg, Mon. Geoc. Fenn., p. 103.
 1855 *Capsus* (*Leptomerochoris*) *molliculus* Kirschbaum, Jahrb. Ver. Nat. Herz. Nassau, x, p. 240; (Sep.) Rhyn. v. Wiesb., Caps., p. 80.
 1860 *Capsus* (*Capsus*) *molliculus* Flor. Rhyn. Livl., i, p. 611.
 1861 *Macrocoleus molliculus* Fieber, Eur. Hemip., p. 321.
 1865 *Macrocoleus molliculus* Douglas & Scott, Brit. Hemip., p. 387, pl. 12, f. 9.
 1871 *Capsus* (*Oncotylus*) *molliculus* Thomson, Opusc. Ent., iv, p. 451.
 1872 *Macrocoleus Hardyi* Bold, Nat. Hist. Trans. Northumberland and Durham Soc. iv, p. 358*

- 1875 *Macrocoleus molliculus* Reuter, Rev. Crit. Caps., [ii], p. 145; Acta Soc. Faun. Fl. Fenn., i, p. 161.
 1875 *Macrocoleus molliculus* Saunders, Trans. Ent. Soc. London, 1875, p. 297.
 1879 *Macrocoleus molliculus* Reuter, Hem. Gymn. Eur., ii, pp. 226, 305.
 1883 *Macrocoleus molliculus* Reuter, Hem. Gymn. Eur., Suppl., I—III p. 537.
 1886 *Macrocoleus molliculus* Puton, Cat. Hem. Palea., edn. 3, p. 59.
 1890 *Macrocoleus molliculus* Atkinson, Cat. Capsidae, p. 152.
 1892 *Megalocoleus molliculus* Saunders, Het. Brit. Isds., p. 303.
 1899 *Megalocoleus molliculus* Puton, Cat. Hem. Palea., edn. 4, p. 73.
 1909 *Megalocoleus molliculus* Oshanin, Verz. Palae. Hem., i, p. 878.
 1910 *Megalocoleus molliculus* Hueber, Jahr. ver. Nat. Wurt., lxvi, pp. 242, 247; (Sep.) Synop. deut. Blindw., ii, p. 282.
 1912 *Megalocoleus molliculus* Jensen-Haarup, Danmarks Fauna, xii, p. 264.
 1920 *Megalocoleus molliculus* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 157.

Specimens examined: MASSACHUSETTS—♂ July 16, 1916, ♀ July 28, 1917, Beach Bluff (H. M. Parshley). ♂ July 16, 1916, Beach Bluff (Chris. E. Olsen).

For a considerable period the writer thought this species must belong to the genus *Oncotylus* and not until European specimens of *Megalocoleus* were examined was the identity of the species revealed. Specimens have been compared with a Reuter determination of *Megalocoleus molliculus* and found to be identical. Although Reuter (1883) and Oshanin (1909) separate *Megalocoleus* and *Oncotylus* by the interposition of several genera, the present writer finds considerable difficulty in recognizing any characters which will separate them. Mr. Van Duzee has recently labelled this form as an undescribed species of *Oncotylus*, further indicating the close relationship of these genera.

According to Reuter (1875), the species occurs on *Achillea millefolia* and *Tanacetum vulgare* in Finland.

***Orthotylus concolor* (Kirschbaum).**

- 1855 *Capsus concolor* Kirschbaum, Jhrb. Ver. Nat. Herz. Nassau, x, pp. 249, 315; (Sep.) Rhyn. v. Wiesb., Caps., pp. 89, 155.
 1861 *Orthotylus concolor* Fieber, Eur., Hemip., p. 289.
 1865 *Litosoma concolor* Douglas & Scott, Brit. Hemip., p. 340. (in part).
 1877 *Orthotylus concolor* Reuter, Ent. Mon. Mag., xiv, p. 128.
 1883 *Orthotylus concolor* Reuter, Hemip. Gymn. Eur., iii, pp. 366, 553.
 1886 *Orthotylus concolor* Puton, Cat. Hem. Palea., edn. 3, p. 56.
 1890 *Orthotylus concolor* Atkinson, Cat. Capsidae, p. 136.
 1892 *Orthotylus concolor* Saunders, Het. Brit. Isds., p. 291.
 1908 *Orthotylus concolor* Hueber, Jahr. ver. Nat. Wurt., lxiv, p. 174; (Sep.) Synop. deut. Blindw., ii, p. 156.
 1909 *Orthotylus concolor* Oshanin, Verz. Palae. Hem., i, p. 844.

Specimens examined: MASSACHUSETTS—2♂ 3♀ July 15 to Aug. 6, 1918, Woods Hole (Chris E. Olsen). These specimens have been compared with European material of *concolor* Kirschbaum and found identical.

In Van Duzee's key⁸ to the species of *Orthotylus*, *concolor* Kirsch. runs to *fraternus* Van D., but from that species it apparently can be separated by the genital claspers and character of the pubescence. In *concolor* the head and pronotum are provided with rather long, coarse black hairs, and covered between by much shorter white silky pubescence, the latter also present to some extent on scutellum and basally on hemelytra. Legs and antennae yellowish green; segment 2 becoming brownish black apically, the last two segments more nearly black. Membrane uniformly infuscated, the veins yellowish to dusky.

⁸Proc. Cal. Acad. Sci., ser. 4, vi, 1916, p. 89.

Blepharidopterus angulatus (Fallén).

- 1807 *Lygacus angulatus* Fallén, Mon. Cim. Suec., p. 76.
 1829 *Phytocoris angulatus* Fallén Hemip. Suec., p. 80.
 1835 *Capsus angulatus* Herrich-Schaeffer, Wanz. Ins., iii, p. 75, f. 292.
 1840 *Phytocoris angulata* Zetterstedt, Ins. Lapp., p. 272.
 1843 *Capsus angulatus* Meyer, Verz. Schw. Rhyn., p. 89.
 1845 *Polymerus* (*Blepharidopterus*) *angulatus* Kolenati, Melet. Ent., ii, p. 108.
 1848 *Capsus angulatus* F. Sahlberg, Mon. Geoc. Fenn., p. 97.
 1855 *Capsus* (*Cyllecoris*) *angulatus* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 203; (Sep.) Rhyn. v. Wiesb., Caps., p. 43.
 1858 *Hactorhinus angulatus* Fieber, Wien. Ent. Monats., ii, p. 313, tab. 6, figs. 8 et 31.
 1860 *Capsus angulatus* Flor, Rhyn. Livl., i, p. 449.
 1861 *Actorhinus angulatus* Fieber, Eur. Hemip., p. 285.
 1865 *Actorhinus angulatus* Douglas & Scott, Brit. Hemip., p. 347, pl. 11, f. 4.
 1871 *Capsus* (*Blepharidopterus*) *angulatus* Thomson, Opusc. Ent. iv, p. 437.
 1875 *Actorhinus angulatus* Reuter, Rev. Crit. Caps., [ii], p. 122; Acta Soc. Faun. Fl. Fenn., i, p. 138.
 1875 *Actorhinus angulatus* Saunders, Trans. Ent. Soc. London, 1875, p. 281.
 1883 *Actorhinus angulatus* Reuter, Hem. Gymn. Eur., iii, p. 400, tab. 1, f. 12.
 1886 *Actorhinus angulatus* Puton, Cat. Hem. Palea., edn. 3, p. 55.
 1890 *Actorhinus angulatus* Atkinson, Cat. Capsidae, p. 132.
 1892 *Actorhinus angulatus* Saunders, Het. Brit. Isds., p. 279, pl. 25, f. 10.
 1906 *Blepharidopterus angulatus* Kirkaldy, Trans. Am. Ent. Soc., xxxii, p. 128. (Logotype)
 1907 *Actorhinus angulatus* Hueber, Jahr. ver. Nat. Wurt., lxiii, p. 254; (Sep.) Synop. deut. Blindw., ii, p. 120.
 1909 *Actorhinus angulatus* Oshanin, Verz. Palae. Hem. i, p. 829.
 1912 *Actorhinus angulatus* Jensen-Haarup, Danmarks Fauna, xii, p. 248, f. 151.
 1920 *Actorhinus angulatus* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 143.

Specimens examined: NOVA SCOTIA—2 ♀ Aug. 9, 1919, Halifax, (W. H. Brittain). These specimens have been compared with European material of *angulatus* Fallén and found to be identical. Saunders (1875) records this species as common on alders in England.

Due to some lack of agreement among systematic workers as to what constitutes type fixation, there has been some difficulty in deciding upon the generic name under which *angulatus* Fallén should be known. Kolenati (1845) erected *Blepharidopterus* as a subgenus of *Polymerus* Hahn, including under it three species, *collaris* Fallén, *angulatus* Fallén, and *bimaculatus* Herrich-Schaeffer, but without indicating the type. Fieber (1858), overlooking the work of Kolenati, founded the genus *Actorhinus* for *angulatus* Fallén (haplotype), and placed the species *collaris* Fallén (= *errans* Wolff) along with *pallidus* Herrich-Schaeffer in his new genus *Dicyphus* (type not indicated). In the same paper Fieber also placed *bimaculatus* Herrich-Schaeffer, by inference along with several other species, in his new genus *Calocoris*. In this disposal of the species it appears that Fieber did not in any way restrict future type selection for *Blepharidopterus* Kolenati (1845). Kirkaldy (1906) designated *angulatus* Fallén as the type of *Blepharidopterus* Kolenati, and this appears to be the first valid type fixation according to the generally accepted rules (Art. 30, Int. Rules Zool. Nomen.).

Globiceps dispar (Boheman).

- 1852 *Cyllecoris dispar* Boheman, Ofv. Kongl. Vet.-Akad., ix, p. 72.
 1860 *Capsus* (*Capsus*) *dispar* Flor, Rhyn. Livl., i, p. 472.
 1861 *Globiceps dispar* Fieber, Eur. Hemip., p. 283.
 1866 *Globiceps dispar* Douglas & Scott, Ent. Mon. Mag., ii, p. 249.
 1867 *Globiceps dispar* Douglas & Scott, Ent. Mon. Mag., iv, p. 48, pl. 1, f. 4. male, fem.

- 1871 *Capsus (Globiceps) dispar* Thomson, Opusc. Ent., iv, p. 436.
 1875 *Globiceps (Kelidocoris) dispar* Reuter, Bihang Kongl. Sv. Vet.-Akad. Handl., iii, p. 29.
 1875 *Globiceps (K. [elidocoris]) dispar* Reuter, Rev. Crit. Caps., [ii], p. 120; Acta Soc. Faun. Fl. Fenn., i, p. 136.
 1875 *Globiceps dispar* Saunders, Trans. Ent. Soc. London, 1875, p. 280.
 1883 *Globiceps dispar* Reuter, Hem. Gymn. Eur., iii, pp. 397, 557, pl. 3, f. 1, ♂
 1890 *Globiceps dispar* Atkinson, Cat. Capsidae, p. 132.
 1892 *Globiceps dispar* Saunders, Het. Brit. Isds., p. 281, pl. 26, f. 2.
 1899 *Globiceps dispar* Puton, Cat. Hem. Palea., edn. 4, p. 69.
 1900 *Globiceps subalpinus* Strobl, Mitth. Nat. ver. Steiermark, xxxvi (1899), p. 193.
 1908 *Globiceps dispar* Hueber, Jahr. ver. nat. Wurt., lxiv, p. 118; (Sep.) Synop. deut. Blindw., ii, p. 140.
 1909 *Globiceps dispar* Oshanin, Verz. Palae. Hem., i, p. 833.
 1920 *Globiceps dispar* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 144.

Specimens examined: COLORADO—2 ♂ July 16, 1898, Little Beaver (E. D. Ball). NEW HAMPSHIRE—♀ (brachyp.) July 20, Glen House, (C. W. Johnson). ONTARIO—♀ (macr.) Aug. 7, Parry Sound (H. S. Parish).

The present material has been compared with identifications by Reuter and found to be identical. Uhler's description of *angustatus* fits the male of *dispar* in all particulars except one statement: "callosities with a groove between, which is partly occupied by a blunt carina that runs back to posterior lobe." In so far as the writer can learn, *angustatus* Uhler has not been recognized since the description of the species was published.

Douglas and Scott (1867) record *dispar* as occurring at the roots of grasses in damp places.

Teratocoris paludum J. Sahlberg.

- 1860 †*Teratocoris antennatus* Flor. Rhyn. Livl., i, p. 433. (in part, not Boheman).
 1871 *Teratocoris paludum* J. Sahlberg, Not. Sällsk. Fauna Fl. Fenn. Forh., xi, (1870) p. 291.*
 1875 *Teratocoris paludum* Reuter, Rev. Crit. Caps., [ii], p. 12; Acta Soc. Faun. Fl. Fenn., p. 28.
 1881 *Teratocoris paludum* J. Sahlberg, Meddel. Soc. Fauna Fl. Fenn., vii, p. 46.
 1890 *Teratocoris paludum* Atkinson, Cat. Capsidae, p. 38.
 1909 *Teratocoris paludum* Oshanin, Verz. Palae. Hem., i, p. 777.
 1920 *Teratocoris paludum* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 135.

Specimens examined: ILLINOIS—♀ June 13, 3 ♀ June 23, Chicago (Wm. J. Gerhard), collected at light. MINNESOTA—♂ Aug. 8, 1910, Koochiching County. 10 ♂ ♀ July 6, 2 ♀ July 9, 1921, University Farm, St. Paul (H. H. Knight), collected at light. NEW YORK—♀ July 22, 1920, Conifer (H. Osborn).

The writer has identified *paludum* by description alone but all other Palearctic species of the genus are at hand for comparison. In general it is certainly poor policy to record Palearctic species from North America without having the necessary exotic material for comparison, but in the case of *paludum* the structures and color characters are so distinctive there seems to be little doubt regarding the identity.

According to Reuter (1875), *Teratocoris paludum* lives on *Carex vesicaria* in Finland.

Megaloceraea recticornis Geoffroy in Fourcroy

- 1775 †*Cimex linearis* Fuessly, Verz. Schw. Ins., p. 519.* (not Fabricius).
 1785 *Cimex recticornis* Geoffroy in Fourcroy, Ent. Paris., i, p. 209.
 1807 *Miris longicornis* Fallen, Mon. Cim. Suec., p. 108.
 1813 *Cimex linearis* Tigny, Hist. Nat. des Ins., iv, p. 287.*
 1829 *Miris longicornis* Fallen, Hemip. Suec., p. 129.

- 1835 *Miris longicornis* Herrich-Schaeffer, Nomen. Ent., i, p. 47.
 1835 *Miris longicornis* Herrich-Schaeffer, Wanz. Ins., iii, p. 43, f. 258.
 1843 *Miris longicornis* Meyer, Verz. Schw. Rhyn., p. 37.
 1852 *Miris longicornis* Costa, Cim. Regn. Neap. Cent., ii, p. 32.*
 1852 *Miris megatoma* Mulsant et Rey, Opusc. ent., p. 126.
 1855 *Miris longicornis* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 192; (Sep.) Rhyn. v. Wiesb. Caps., p. 32.
 1858 *Megaloceraea longicornis* Fieber, Wien. Ent. Monats., ii, p. 301. (Haplotype).
 1860 *Miris longicornis* Flor, Rhyn. Livl., i, p. 434.
 1861 *Megaloceraea longicornis* Fieber, Eur. Hemip., p. 243.
 1865 *Miris longicornis* Douglas & Scott, Brit. Hemip., p. 289.
 1869 *Megaloceraea longicornis* Puton, Cat. Hemip., p. 21.
 1871 *Miris (Megaloceraea) longicornis* Thomson, Opusc. Ent., iv, p. 415.
 1875 *Megaloceraea (M. [egaloceraea]) longicornis* Reuter, Rev. Crit. Caps., [ii], p. 6; Acta Soc. Faun. Fl. Fenn., i, p. 22.
 1875 *Megaloceraea longicornis* Saunders, Trans. Ent. Soc. London, 1875, p. 260.
 1888 *Megaloceraea recticornis* Reuter, Acta Soc. Sci. Fenn., xv, p. 611, No. 207.
 1890 *Megaloceraea recticornis* Atkinson, Cat. Capsidae, p. 36.
 1890 *Megaloceraea linearis* Bergroth, Ann. Soc. Ent. Fr., for 1890, Bul. p. LXVI.
 1892 *Megaloceraea longicornis* Saunders, Het. Brit. Isds., p. 223, pl. 20, f. 6.
 1896 *Megaloceraea recticornis* Hueber, Jahrb. ver. Nat. Wurt., 1, p. 56; (Sep.) Synop. deut. Blindw., i, p. 52.
 1899 *Megaloceraea linearis* Puton, Cat. Hem. Palea., edn. 4, p. 57.
 1906 *Nostostira (Megaloceraea) longicornis* Kirkaldy, Trans. Am. Ent. Soc., xxxii, p. 144.
 1909 *Megaloceraea linearis* Oshanin, Verz. Palae. Hem., i, p. 772.

Specimens examined: WISCONSIN—2 ♀ June 27, 1914, Madison, (S. B. Fracker), on "foxtail". Probably on *Setaria viridis*, a plant which has been introduced from Europe. These specimens have been compared with European material determined by Reuter and found to be identical.

***Adelphocoris lineolatus* (Goeze).**

- 1778 *Cimex lineolatus* Goeze, Ent. Beytr., ii, p. 267.
 1785 *Cimex albinus* Geoffroy in Fourcroy, Ent. Paris, i, p. 208.
 1800 *Miris laevigatus* Wolff, Icones Cim., i, p. 36, tab. iv, f. 36. (not Linnaeus).
 1804 *Miris laevigatus* Panzer, Faun. Germ., fasc. xciii, f. 21. (not Linnaeus).
 1807 *Lygaeus chenopodii* Fallen, Mon. Cim. Suec., p. 74.
 1829 *Phytocoris Chenopodii* Fallén, Hemip. Suec., p. 77.
 1833 *Phytocoris binotatus* Hahn, Wanz. Ins., i, p. 202, f. 103.
 1835 *Capsus chenopodii* Herrich-Schaeffer, Nomen. Ent., i, p. 50.
 1835 *Phytocoris bipunctatus* Burmeister, Handb. Ent., ii, p. 270.
 1840 *Phytocoris binotatus* Blanchard, Hist. Nat. Ins., p. 137, pl. 5, f. 7.
 1843 (?) *Capsus brevicollis* Meyer, Verz. Schw. Rhyn., p. 47, t. I, f. 4.
 1843 *Capsus chenopodii* Meyer, Verz. Schw. Rhyn., p. 51.
 1845 *Phytocoris Chenopodii* Kolenati, Melet. Ent., ii, p. 113.
 1848 *Capsus Chenopodii* F. Sahlberg, Mon. Geoc. Fenn., p. 100.
 1852 *Phytocoris bipunctatus* Costa, Cim. Regn. Neap. Cent., iii, p. 260.*
 1855 *Capsus (Deracocoris) Chenopodii* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 217; (Sep.) Rhyn. v. Wiesb., Caps., p. 57.
 1860 *Capsus (Capsus) Chenopodii* Flor, Rhyn. Livl., i, p. 501.
 1861 *Calocoris chenopodii* Fieber, Eur. Hemip., p. 255.
 1865 *Deracocoris Chenopodii* Douglas & Scott, Brit. Hemip., p. 325.
 1871 *Capsus Chenopodii* Thomson, Opusc. Ent., iv, p. 420.
 1875 *Calocoris Chenopodii* Reuter, Bilhang Kongl. Sv. Vet.-Akad. Handl., iii, p. 13.
 1875 *Calocoris Chenopodii* Reuter, Rev. Crit. Caps., [ii], p. 38; Acta Soc. Faun. Fl. Fenn., i, p. 54.
 1875 *Calocoris chenopodii* Saunders, Trans. Ent. Soc. London, 1875, p. 270.
 1878 *Lygus Chenopodii* Snellen v. Vollenhoven, Hem. Het. Neerl., p. 189, pl. 13, f. 7.
 1879 *Calocoris chenopodii* Distant, Sec. Yark. Miss., Rhyn., p. 10.
 1880 *Calocoris chenopodii* var. *implagiatus* Westhoff, Jahresb. Westfal. Prov.-Versamml. Kunst., ix, p. 74.*
 1886 *Calocoris Chenopodii* Puton, Cat. Hem. Palea., edn. 3, p. 48.

- 1887 *Calocoris Chenopodii* Reuter, in Imp. Soc. Nat. Sci., xxxix, Turkestan zool. Investig., ii, pt. v, Hemip. pt. I, p. 6.
 1888 *Calocoris lineolatus* Reuter, Acta Soc. Sci. Fenn., xv, p. 632, No. 234.
 1890 *Calocoris lineolatus* Atkinson, Cat. Capsidae, p. 73.
 1891 *Calocoris lineolatus* var. *bisbipunctatus* Reuter, Ofv. F. Vet.-Soc. Forh., xxxiii, p. 189.
 1892 *Calocoris chenopodii* Saunders, Het. Brit. Isds., p. 243.
 1896 *Adelphocoris lineolatus* Reuter, Hemip. Gymn. Eur., v, p. 222 et 379.
 1899 *Adelphocoris lineolatus* Puton, Hem. Palea., edn. 4, p. 60.
 1899 *Adelphocoris lineolatus* Hueber, Jahrb. ver. Nat. Wurt., lv, p. 358.
 1904 *Calocoris lineolatus* Distant, Fauna Brit. Ind., ii, p. 451, f. 291.
 1906 *Adelphocoris lineolatus* Reuter, Ann. Mus. zool. St. Pet., x, p. 10 et 20.
 1909 *Adelphocoris lineolatus* Oshanin, Verz. Palae. Hem. i, p. 681.
 1912 *Adelphocoris lineolatus* Jensen-Haarup, Danmarks Fauna, xii, p. 214.
 1920 *Adelphocoris lineolatus* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 116.

Specimens examined: CAPE BRETON ISLAND—3 ♂ 2 ♀ August 1917, Cheticamp. (F. Johansen). The writer has compared the present material with Reuter determinations of *lineolatus* Goeze, finds that the specimens are structurally identical but pertain to variety *binotatus* Hahn.

Stenodema virens (Linnaeus).

- 1767 *Cimex virens* Linnaeus, Syst. Nat., edn. 12, i, p. 730.*
 1908 *Stenodema virens* Horvath, Ann. Mus. Natl. Hung., vi, p. 5.
 1917 *Stenodema virens* Van Duzee, Cat. Hemip., p. 304.

This species was first recorded from America by Horvath (1908) but without definite locality. Van Duzee (1917) was unable to add anything regarding the distribution. Since receiving European specimens of *virens* for comparison, the writer has gone over the available material in the genus *Stenodema* and desires to record the following observations. Both the typical *virens* and the variety *testaceum* are represented.

Specimens examined: ALASKA—♀, "Alaska". COLORADO—♀ June 24, ♀ July 10, 1900, Fort Collins. ♀ July 13, 1901, Palmer Lake. ♂ Sept 19, Buena Vista. ♂ Sept. 20, Gunnison. 2 ♂ July 27, Arapahoe Peak, alt. 9,856 ft. (A. C. Burrill). 2 ♀, "Colorado" (Popenoe). MONTANA—♀ June 20, 1906, Bozeman. 2 ♂ 10 ♀ July 18, Park County; ♂ July 31, Missoula (A. A. Nichol). NEVADA—♀ July; Ormsby County (C. F. Baker). OREGON—♀ September, Corvallis. ♂ ♀ Aug. 17, 1920, Portland, (A. A. Nichol). WYOMING—♂ 6 ♀ July 20-25, 1920, Yellowstone Park (A. A. Nichol).

The writer is quite convinced that *Miris instabilis* Uhler (1875) should be referred to *virens* Linnaeus rather than to *Stenodema vicinum* (Provancher). This view is supported by the fact that the original description and figure given by Uhler, fit *virens* Linnaeus more closely than is true of *vicinum* Provancher. To this it may be added that no specimens of *Stenodema vicinum* (Provancher) have been seen which came from Colorado, while *virens* is apparently rather common.

Orthocephalus mutabilis (Fallén)—At Ithaca, New York, during the last week of June and the first week of July, 1920, the writer took several more specimens of this species, finding them on ox-eye daisy (*Chrysanthemum leucanthemum*) in company with *Plagiognathus chrysanthemi* Wolff. *Mutabilis* was found most abundant on the Cornell University campus and farm land belonging to the College of Agriculture. Mr. J. L. Frank took one specimen July 4, at Owego, New York.

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